Annual Report

of the

Department of Agriculture in the Bombay Presidency

For the Year 1923-24

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INTRODUCTION.

I will introduce this report with a few remarks upon certain important features in the present agricultural economic situation.

First and foremost the cotton crop continues to be the main source of agricultural wealth to the Province and owing to the sustained high prices which have prevailed during and since the War, there is much prosperity in the principal cotton tracts. A case was recently brought to my notice in the Karnatak where the gross income of a village amounted to Rs. 10 lakhs in the year under report and the income of one individual amounted to just under one lakh, *viz.*, Rs. 95,000. It is important to point out that this does not represent the gross value of the crop produced in the village itself but it largely reflects the business acumen of the actual growers of cotton in that village who bought up standing cotton crops in adjoining villages after correctly appraising the weather signs of the season, *e.g.*, the absence of unfavourable winds.

On the other hand the sugar industry is going through a period of depression. The Deputy Director, S. C. D., draws attention in his annual report (*vide* Appendix D) to the critical position of that crop. During the War the beet sugar industry which previously contributed about half the *total* sugar production of the world, was completely dislocated. In consequence of this and also in response to the increased demand for sugar during the War, the cane sugar industry entered upon a period of prosperity. Since the conclusion of the War the beet industry has largely recovered and the sugar supply of the world is abundant

while the purchasing capacity of the people in most countries has fallen—hence there has been a slump in sugar values which has not been associated with a corresponding reduction in cost of production which has risen greatly in this Presidency. In the year under report the sugar cane grower was faced not only with an unfavourable season but with a very poor market, the price falling at one time to Rs. 18 per palla of 250 lbs.

Thus many growers have incurred a loss on their sugar cane crop and tenants are demanding a reduction of rents while some have actually run away. It is anticipated that there will be a considerable contraction in the area under sugar cane in the current season (1924-25) amounting to perhaps 10 per cent. on the Deccan canals. This Department is, therefore, giving special attention to the problem of reducing the cost of production, more particularly through the reduction of the heavy applications of costly artificial manures which could be economically adopted in the years of prosperity.

Another important fact, revealed by statistics, is the loss of efficiency in recent years of the wells used for irrigation. The figures are somewhat disconcerting, but it is recognised that the efficiency of most of our wells ultimately depends upon the performance of preceding monsoons and there is reason to anticipate that the recent very heavy rains in Gujarat will materially contribute to the recuperation of the underground sources of water supply.

ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, BOMBAY PRESIDENCY, 1923-24.

The activities of the Department resolve themselves into the following divisions:—

Research.	Service.
Propaganda.	Education.
Organization.	Statistics.

Research.

The Department is conducting research in several directions. The most developed research is that which deals with the improvement of the varieties of the Staple Crops, and chief attention has hitherto been concentrated upon Cotton, Rice, Wheat, Jowar, Sugarcane and Groundnuts. Much investigation has also been devoted to the problems underlying crop production, notably cultural methods and manuring. A great deal has been done in the Engineering branch which deals with implements and machinery. Horticulture and Live stock are receiving special attention, each under the direction of an Imperial Service Officer, and finally Plant diseases and insect pests continue to be a very important feature of our Research programme.

Staple Crops.

2. *Cotton.*—There are five principal centres at which research on this crop is in progress, namely, Dharwar, Surat, Dhulia, Viramgaum (near Ahmedabad) and Mirpurkhas. Improved strains have been introduced into general cultivation from all these centres except Viramgaum where the work is still in an early stage of development.

In the Dharwar area which, for the purposes of this Department, coincides with the Karnatak embracing the three districts of Dharwar, Bijapur and Belgaum, the cotton interest measured in terms of acres is approximately $1\frac{1}{2}$ millions of which the Kumpta variety covers over one million and the Saw-ginned Dharwar American about half a million acres.

The Department is introducing an improved strain of Kumpta known as Dharwar I which was sown on an area of 75,000 acres in the year under report and the net gain to the cultivator is estimated at Rs. 5 per acre. Similarly the Department is introducing an improved type of Saw-ginned Dharwar American, and the improved strain is known as Gadag I which was sown on an area of 65,000 acres in the year under report and the net gain to the cultivator is estimated at Rs. 13 per acre.

In the Surat area which coincides with the tract lying between the Narbudda River on the North and the boundary of the Surat District on the South the Department is introducing an improved strain known as 1027 A. L. F. This variety is now extensively grown throughout the whole of this tract. The total area under the control of the Department for seed purposes was 9,146 acres, and the premium obtained for the lint was Rs. 20 to Rs. 25 per kandy on a basis of Rs. 300.

In the Dhulia tract which coincides with Khandesh and Nasik where the cotton area runs to $1\frac{1}{2}$ million acres the Department is introducing N. R. cotton (a selection out of local). It has not hitherto been found possible to keep track of the area sown with this cotton which must now be very considerable and widespread, but the amount of seed issued from the Government Seed Farm at Jalgaon was 31,360 lbs. in the year under report.

In Sind a similar strain of N. R. cotton known as 27 W. N. is being introduced but the area is still small.

3. So much for actual introductions, but the Department is aiming at producing still more superior strains. Thus at Dharwar there is a very promising cross between Kumpta and Roseum. This hybrid has been found to yield well. It also possesses a high ginning percentage and a staple substantially over one inch. A special feature of this cotton is the colour of the fibre which is much whiter than the local Kumpta cotton. Multiplication of this strain has just been commenced. Another valuable hybrid at this station is a cross between selected Kumpta (D1) and Wagale, a Burma wilt resistant cotton. This hybrid is still in an early stage but shows signs of resisting wilt.

At Dhulia the Department has produced a highly promising hybrid (BXX27) between Bani and Comilla cottons

which, while possessing a high ginning percentage, has a much superior fibre to that of N. R. cotton. Similar cotton breeding operations are in progress at Surat, Viramgaum and Mirpurkhas.

4. *Rice.*—Improved strains of rice are being produced at the following breeding stations, Larkana in Sind, Karjat and Ratnagiri in the Konkan, and Mugad in the Karnatak. The work, however, has progressed only at Karjat to the stage when seed of improved strains can be issued. In the year under report there was sufficient seed of strain No. 42 (a Kolumba selection) to sow 10,000 acres. This strain is medium fine grained and a good yielder and is suitable for cultivation in Thana and Kolaba Districts.

5. *Wheat.*—Work is in progress at Jacobabad in Sind and at Poona in the Deccan. Pusa 12 continues to give good results in Sind, where it has now been grown by the public for some years, but there are certain improved strains of Phundani and Thoree (local varieties) which are very promising and which under certain conditions may prove more suitable than Pusa 12.

The work at Poona is intended to serve the Deccan districts including Khandesh and the Karnatak; and it has progressed to the stage when seed of promising strains is being sent out for confirmation in various tracts. Several of these have done well in the trials conducted during the year under report at Dharwar in the Karnatak, Jalgaon in Khandesh, and Dohad in the Panch Mahals.

6. *Jowar.*—Work on this crop has only recently been initiated at the following centres, Dharwar, Surat and Larkana. Some promising improved strains will be available for introduction next year.

7. *Sugarcane.*—There is a central research station for this crop at Manjri near Poona. The average results obtained in a four years comparative experiment at Manjri, show that several varieties have done very much better than the Standard Pundia variety. Thus the yields of "Red sport" and "D—109" have averaged from 40 to 50 per cent. more produce per acre than Pundia whether we take stripped cane or gul (raw sugar) as the criterion.

On the Godavari Canal tract "Manjav" has given the best results, which illustrates the importance of confirming

varietal trials on each important canal before advising the public.

8. *Groundnut.*—Work on this crop has been very successful in Khandesh where the area has risen from 4,100 acres in 1912-13 to 1,06,044 in 1922-23 largely owing to the introduction of the Spanish peanut variety by the Department of Agriculture. This variety is an early maturing variety and can be grown on rainfall without irrigation. This crop is also receiving special attention at Dharwar.

Special Research Schemes.

9. In addition to the foregoing there are a large number of special research schemes most of which are financed from outside sources. The most important of these are :—

Description of Scheme.	How financed.	Cost.
Cotton Boll Shedding Scheme at Surat.	The Indian Central Cotton Committee.	A grant of Rs. 25,000 per annum for three years, in the first instance.
Cotton Boll Worm Scheme at Surat.	Do. ...	A grant of Rs. 15,000 per annum for three years, in the first instance.
Cotton Wilt-disease Scheme at Dharwar.	Do. ...	A grant of Rs. 25,000 per annum for three years, in the first instance.
The Lavala-weed Scheme at the Agricultural College.	The Sir Sassoon David Trust Fund.	A grant of Rs. 13,000 spread over three years. The whole is used up.
The Improvement of Grass-lands Scheme at several places.	Do. ...	A grant of Rs. 15,000 spread over three years, spent and an additional grant of Rs. 5,000 now asked for.
The Potato Seed-supply and Storage Scheme at Poona.	Do. ..	A grant of Rs. 20,000 received in two instalments spent.
The Drought Resisting Strains of Bajri Scheme at Poona.	Do. ...	A grant of Rs. 20,000 spread over three years. Balance Rs. 645.

Description of Scheme.	How financed.	Cost.
The Cardamom Disease Scheme in Kanara.	The Sir Sassoon David Trust Fund.	A grant of Rs. 7,000 spread over three years. Balance Rs. 120.
The Jowar Stem-Borer Scheme at Surat.	Do. ...	A grant of Rs. 20,000 spread over three years, of which Rs. 13,332 received. Balance Rs. 2,800.
The Agricultural Implement Scheme at Poona.	Do. ...	A grant of Rs. 10,000 spread over three years, of which Rs. 3,333 received. Balance Rs. 1,773.
The Mango Improvement and Marketing Scheme in the Konkan and Karnatak.	Do. ...	A grant of Rs. 15,000 proposed to be spread over three years, of which Rs. 5,000 asked for from the Trustees.
The Die-back Disease of Citrus Trees Scheme in the Deccan.	Government ...	Rs. 500 sanctioned from the grant for Agricultural Experiments.
The Tobacco Breeding Scheme at Nadiad.	Do. ...	Rs. 3,672 sanctioned from the grant for Agricultural Experiments.
Dry Farming Scheme at Manjri near Poona.	Do. ...	Rs. 2,000.
Canal Weed Scheme at Poona.	Do. ...	Financed by the Officers carrying on the schemes from the grants at their disposal.
The Nitrogen Recuperation Scheme of Deccan Soils at Poona.	Do. ...	Do.
The Potato Fusarium Disease Scheme at Poona (which is associated with the General Potato Improvement Scheme above).	Do. ...	Do.

There is not space in which to discuss these Schemes separately or in detail, but they are at all stages of development. Thus Dr. Burns' work on Lovala Weed is complete and is now being published as a Memoir while the Implement Scheme has only just been commenced.

10. The chief features in the organization of these important research schemes are :—

(1) The work is directted and controlled by a Committee of Agricultural Officers having special knowledge of the subjects.

(2) A whole-time staff is allotted to each scheme, the senior officer being competent to conduct independent or semi-independent research.

(3) Many of the personnel are engaged temporarily for the period assigned to the particular research scheme.

(4) A time limit is fixed and this is to be extended only if the progress of the research is considered satisfactory and the ground could not be covered in the time available.

This organization appears to be a distinct advance in the procedure of the Department, especially as regards the whole-time staff. In the past for want of sufficient staff, officers have had to diffuse their attention over too many activities so that rapid progress could not be made in any direction. This cannot happen now where the work is financed by independent bodies like the Indian Central Cotton Committee who carefully watch the progress of their schemes. The three research schemes undertaken on behalf of this Body have been well launched in the year under report and the officers in charge of each have already an excellent record of progress to their credit. Some of the charts based on data worked out by them are very illuminating.

Crop Production.

(Cultural and Manurial.)

11. Perhaps the most interesting advance in cultural treatment has been made at Surat where experiments with Ridge Cultivation have been in progress for some years. This is a tract where the land is very flat and the soil of a heavy description, and during periods of heavy rainfall it has been observed that the crops get a set-back. The average results obtained during the past two years on the Surat Farm show that the yield of cotton has been increased by 15 to 23 per cent. by simple ridging and intercultivation and by 41 per cent. by ridging followed by deep intercultivation associated

with a dressing of 10 tons of farm yard manure per acre. Similar results were obtained with jowar where the increases were 23 per cent. from simple ridging and intercultivation, and 24 to 31 per cent. where manuring was associated with ridging.

The cultivators are very keen to adopt this new method of cultivation provided some cheap method of making the ridges in the hot weather, can be devised. It is believed that tractor cultivation may prove very useful in this connection, and a Case Tractor has recently been secured for the purpose. In the meantime, however, suitable bullock-drawn implements are being supplied by the Department, and 285 acres were thus prepared by one-pair implements in the surrounding villages in the year under report. Implements to the value of Rs. 1,579 have already been disposed of by the Department for this purpose.

12. As regards manures the value of castor cake for cotton is becoming more widely recognized, and there is now a strong demand for this fertilizer in Khandesh where the Department distributed some 60 tons, worth Rs. 10,000, in the year under report. The most economical dose appears to be 300 lbs. per acre. Bone meal is giving good results on rice in Belgaum District, where the use of this fertilizer is steadily increasing in the Khanapur Taluka.

In sugarcane production the main problem is the supply of nitrogen. Experiments at Manjri show that in addition to the ordinary heavy dressing of farm yard manure containing 200 lbs. of nitrogen the outturn can be progressively increased by top dressing with artificials (chiefly sulphate of ammonia and safflower or castor cake) applied in three doses up to another 300 lbs. of nitrogen. The exact quantity to apply, therefore, depends upon the price of gul (raw sugar). Owing to the recent slump in the price of this product it is economical to reduce the total quantity of nitrogen, *vide* para. 7 (2) of Appendix D.

13. As regards irrigation of sugarcane the recent experience of this Department in its investigations on the Manjri Experimental Station, indicates that we shall have to modify our views somewhat upon the optimum water requirements of this crop. Hitherto it was generally considered that 75 acre-inches (plus rainfall which is very little) were adequate to produce a full crop. The Deputy Director

of Agriculture, however, publishes figures under para. 7 (5*b*) of his report, *vide* Appendix D, which show that the crop has increased proportionately with the irrigation applied, to 125 acre-inches.

Agricultural Engineering.

14. *Implements.*—The iron plough continues to gain in popularity. The Department has now put out 11,000 ploughs in the Dharwar area and this is only a small fraction of the total number in use. In this respect the pioneer work of the Department has been ably seconded by the private enterprize of Messrs. Kirloskar Brothers who started manufacturing ploughs in a very small way about 15 years ago, and their works now turn out some 200 per day. These ploughs have spread far afield and two of the best markets are the Nizam's Dominions and the Berars. The most noticeable recent progress in this Presidency has been (1) in Athani Taluka of the Belgaum District, where there are now some 5,000 iron ploughs and (2) in Khandesh.

15. The Agricultural Engineer is now paying special attention to the design of implements. In particular he is engaged in designing a cheap type of iron plough for Sind and an improved type of winnowing machine for Khandesh. Other implements receiving special attention are clod crushers and seed drills. In the latter case he is attempting to replace hand feeding by a simple device, in the country seed drill.

16. *Machinery.*—In this sphere the Agricultural Engineer has been chiefly engaged in investigations connected with tractor cultivation, power pumping and machinery for shredding and baling jowar kadbi at Karajgi where the Department is organizing a famine fodder reserve.

Horticulture.

17. This important branch of the Department has not been developed to the extent which seems desirable. The Department now has an Imperial Service Horticulturist with a small staff, including a District or touring Assistant.

It appears essential to provide this section with a well equipped Central Research Station. This station already exists in the Ganeshkhind Botanical Gardens, but the general facilities provided there appear to be inadequate. The canal

water supply is not very dependable, and parts of the garden are too high to receive this irrigation. It seems essential to provide a good pumping plant which will guarantee a satisfactory supply of irrigation throughout the year from the adjoining river. Then the grant must be increased and made proportionate to the importance of the work to be undertaken.

18. There are several most promising lines of work already in progress which should be continued and developed including :—

(1) work on Figs,

(2) work on Mangoes,

(3) work on the juices of certain fruits, such as Jhambul (Eugenia, Zyzygimin Jambolana) and Pomegranite (Punica Granatum),

(4) the drying and canning (not yet undertaken) of fruits, and

(5) the supply of first class reliable fruit stock to the various agricultural stations as well as to the general public.

19. Detailed proposals have been recently submitted to Government regarding the steps which should be taken to encourage fig cultivation in the Maharashtra. Recently there has been much clamour for assistance in mango cultivation, and there appears to be a very great field for this fruit in the Mallad tract of the Karnatak, where it grows splendidly and where pig make crop cultivation a very precarious business.

In Khandesh also there is a fruit awakening among the people. Thus Rao Saheb Gulabchand of Dhulia has placed part of his garden at the Department's disposal for opening a nursery. A Horticultural Fieldman is now stationed there and has commenced work on citrus fruits (lemons and oranges). Again Mr. Maneckchand Kisondas of Utran in East Khandesh has planted an area of 120 acres with oranges and lemons and intends to manage this orchard on business lines.

In Sind there are great possibilities for :—

(1) dates,

(2) raisin grapes, and

(3) lemons for juice.

In nearly all of these directions Mr. Cheema has some work in hand, but, if the best is to be got out of his labours it will be necessary to strengthen his budget and laboratory resources. For example as regards the study of fruit juices the following problems require deeper investigation involving better facilities :—

(1) Preservation of colour.

(2) The value of condensed juices.

(3) Packing and packing materials.

Live Stock.

20. The Bombay Presidency is rich in live stock. There are at least half a dozen really good breeds of cattle within her boundaries, and the preservation and improvement of these valuable breeds, has received an impetus through the report of the Cattle Committee presided over by Rao Bahadur Chitale, which was issued during the course of the year. At the present time the Department possesses three Cattle Breeding Farms as follows :—

I.	The Willingdon Farm near Karachi.	For the Red Karachi breed.
II.	The Northcote Cattle Farm at Chharodi near Ahmedabad.	For the Kankrej breed.
III.	The Bankapur Farm in Dharwar District.	For the Amrit Mahal breed.

In each case the object is to build up a first class herd of pure bred cattle with the object of supplying pedigree bulls for distribution in the appropriate tracts.

The following table tabulates the distributions in the year under report :—

Division.	No. of premium bulls issued.								Total No. of premium bulls for each Division.
	Dangi.	Kankrej.	Tapti Khillari	Mhaswad Khillari.	Amrit Mahal.	Buffalo Bulls.	Merino rams	Sindhi Bull.	
Northern Division	3	11	1	...	...	3	...	...	18
Central Division	...	...	...	3	...	...	...	...	3
Southern Division	...	...	..	...	5	...	2	...	7

21. Now that there is an Imperial Service Officer in charge of Live stock operations, it is anticipated that these opertaions will rapidly develop, and a special feature is being made of annual shows in the vicinity of these Farms to stimulate interest in cattle breeding. These shows have been very successful and there is no doubt that the people of this Presidency are genuinely interested in the improvement of cattle. It is hoped that funds will soon be forthcoming for establishing similar Farms for the other principal breeds, but in the meantime an effort is being made to exploit a few of the best Gaorakshahs for this purpose. The conditions are that a certain number of approved cows shall be set aside and mated with a premium bull supplied by Government and that a competent manager shall be maintained. Arrangements on these lines have been made at Kandivli and Mulund in the Thana District.

Propaganda.

22. The whole Presidency with very few districts excepted, is now covered, though thinly, by an Agricultural Propaganda Staff. These officers are called District Agricultural Overseers, and these are one or two per District. Most of these Overseers have kamgars, trained coolies, to assist them. During the year under report the chief activities of these officers have been :—

A. Demonstration of,

(1) Improved strains and varieties of staple crops upon cultivators' own fields.

(2) Artificial manures such as sulphate of ammonia for sugarcane and castor cake for cotton.

(3) Implements.

(4) Improved cultural methods, *e.g.*, sowing cotton on ridges in the Surat area.

(5) Methods to combat diseases and insect pests, *e.g.*,

(*a*) Copper sulphate treatment of jowar seed as a preventive of smut disease.

(*b*) Poisoning hairy caterpillers which in certain seasons work great havoc upon young crops in North Gujarat.

B. Lecturing upon the subjects mentioned above with the aid of majic lanterns and illustrations. Thus in the North Central Division there were 70 such meetings in the year under report.

C. Advisory work with local bodies.

23. This work is somewhat hampered by the smallness of the grants available for incidental expenditure in connection with the miscellaneous duties of the Agricultural Overseers and also because the Travelling Allowance grants are decidedly too low. Thus it is hardly possible to keep these propagandists working at full pressure.

ORGANIZATION.

24. This branch of Agricultural Development has received special attention in recent years. In 1919 a Provincial Board of Agriculture was created which meets once in one to two years. Its functions are deliberative and advisory and it has been the means of bringing about the appointment of two Committees whose important reports were published during the year. These were—

(1) The report upon the damage done by wild animals,

and

(2) The report upon the improvement of cattle in this Presidency.

In 1921, Divisional Boards of Agriculture were constituted for each Division. These are small compact bodies which meet quarterly and exercise a close control over all current work in the districts, of the Agricultural and Co-operative Departments. Their recommendations are submitted to a Joint Board consisting of the Director of Agriculture and the Registrar of Co-operative Societies. Most of these Boards have done good work during the year, and their advent is a distinct advance in the organization of agriculture in this Presidency.

In 1922, Government decided to create Taluka Development Associations in selected talukas. The object of these associations is to provide a local agency for introducing improvements recommended by the Department and generally to promote agricultural advancement. These are useful bodies and have great potential value but the weak point in

their organization is their financial resources, with which I have dealt in para. 43 below. The total number of these Development Associations is now 38, as shown in detail in Appendix A.

25. The most important development in agricultural organization in the year under report has been the introduction of the Government of India Cotton Transport Act. Under this Act, six areas have been notified in this Presidency as follows:—

Karnatak.	Gujarat.
Dharwar area.	South Surat area.
Bijapur area.	Surat area.
Bagalkot area.	Ankleshwar area..

The operation of this Act has already done great good by excluding the importation of inferior cotton into certain areas whose cotton was losing its identity owing to wholesale mixing. Formerly some 20,000 bales of inferior cotton were imported into Hubli market in the Dharwar area, which is about a third of the cotton handled in this market; that has been stopped and the reputation of Hubli (Kumpta) cotton has been largely restored in the Bombay market where the mills are readily taking it up again.

In 1923, some 29 lakhs of lbs. of inferior seed-cotton were transported southwards over the Narbudda Railway bridge for mixing with superior cotton in the Surat area. This has been stopped with great benefit to the growers of superior cotton. The margin in price between Navsari and Broach cotton has consequently widened from Rs. 100 to Rs. 150 per kandy. Some inconveniences to trade have been revealed but it is hoped that by readjusting boundaries and through licensing all reasonable complaints will be met.

26. Non-credit Co-operation continues to receive very earnest attention and the Agricultural Officers are co-operating closely with the Co-operative Department in this respect. Several Deputy Directors of Agriculture have been giving special attention to this work. The progress of this type of co-operation is perhaps the most real measure of the success of the whole co-operative movement. In the long run it probably has deeper significance upon the prosperity of the Agriculturist than has the credit section. It is, however,

much more difficult to organize and make successful, but the Cotton Sale Societies in the Southern Division at Hubli and Gadag are very encouraging.

The former did business in the past season (1924) to the extent of 21,000 docras (1 docra=336 lbs.) which represents 20 per cent. of the entire seed-cotton brought into this the most important market in the South of the Presidency.

These Societies, however, still sell cotton in the unginned state and thus the produce of the cotton grower continues to pass through middlemen before it reaches the mills or the exporters. The problem to solve is how to put the cotton produce of the cultivator on the Bombay market in the form of lint, and this is receiving the careful attention of these Cotton Sale Societies.

Other promising branches of the non-credit movement are:—

(1) Implement Societies to which some reference has been made in para. 29 below.

(2) Irrigators' Societies for the special purpose of making joint representations to the Irrigation Department.

(3) Gul Sale Societies one of which at Poona was recently registered by the Registrar of Co-operative Societies, and did business to the extent of 1,250 cart loads of gul (raw sugar).

SERVICE.

27. The chief direct services which the Department is rendering to the public are in connection with the—

(1) Supply of seed, implements and manures

and

(2) the boring of wells and design of pumping installations.

The Department has also begun land improvement work in the Southern Division through one of its existing staff while a Land Development Officer has quite recently been added to the staff of the Department.

28. Under the supply of seed the Department has built up a somewhat elaborate organization. Thus in the Surat

area the area under the control of the Department was over 9,000 acres which provided $1\frac{3}{4}$ million lbs. of seed, all of which was purchased and distributed without loss. In the Dharwar area the Department controls the seed of Kumpta Cotton grown on an area of 5,000 acres in and around Sherewad near Hubli, while there is a similar arrangement for American Cotton at Hulkoti near Gadag, and 38 depôts were opened for the distribution of this seed. In Sind where maintaining improved cottons in a state of purity presents peculiar difficulties the Department has taken up a large piece of waste land in Chellaro village on the west branch of the Jamrao Canal. This is run on Zamindary lines, *i.e.*, the land is let out to tenants on the share system, one-third of the produce being the Department's share and two-thirds the tenants' share. The Deparment has thus complete control over this crop and arranges for its sale in consultation with the tenants. In this way the whole produce is sold off to a reliable firm who agrees to gin it separately and return the seed to the Department. In the year under report the area under cotton was 242 acres and the produce realized Rs. 28,143. The Department after meeting the cost of laying out new water channels realized Rs. 5,000 which after meeting the salary and travelling allowance of the manager still left a credit balance of Rs. 1,136. The good seed obtained amounted to 73,440 lbs.

29. The chief service this Department renders to the public under implements is through the organization of implement depôts. One of the largest of these depôts is at Shevgaon in the Ahmednagar District. This is not a Departmental depôt but is controlled by a Society which has received the special attention of the Agricultural Overseer with good results. It has now applied for registration under the Co-operative Societies' Act. The capital of this Society is Rs. 10,000 out of which about Rs. 4,750 have been collected. During the past two years it stocked over 100 ploughs for hire purposes and earned Rs. 3,428 from 500 cultivators during that period.

It is satisfactory to note that this Depôt work is now passing out of the hands of the Department into those of Societies and private individuals, and this movement has recently received a great stimulus owing to Messrs. Kirloskar Brothers reducing their prices for iron ploughs by nearly 50 per cent. owing to competition.

30. As regards Boring this work is now in the hands of the territorial Deputy Directors and the following table summarizes the work done in the different divisions of the Presidency in the year under report:—

Division.	Number of Boring Machines.		Successful bores.	Unsuccessful bores.	In progress.	Total number of bores made.	Remarks.
	With this Department.	Total No.					
1. Gujarat ...	5	7	19	4	6	29	Excluding 4 rejected.
2. N. C. D. ...	3	3	8	12*	...	20	*Unsuccessful and in progress.
3. S. C. D. ...	6	6	50	11	...	61	...
4. S. D. ...	5	5	36	11	3	50	Excluding 9 rejected.
5. Konkan ...	7	7	24	13	6	41	...
6. Sind ...	1	1	...	...	...	...	...
Total ...	27	29	135	51	15	201	

In addition to the 27 boring machines actually on hand, two machines are lent to the District Local Board, Kaira, and 8 Cawnpore machines are under adaptation for exploratory work.

31. Progress in boring has not been quite so satisfactory as is desirable, and recently comprehensive suggestions have been submitted to Government for putting this work on a more satisfactory basis. It seems essential to reduce the cost to the cultivator and to increase facilities by adding substantially to the number of machines in stock which is only 27. Another important point which has been recognized is that all machines should be power-driven and action is being taken to convert all hand machines into power units.

32. Under land development the Special Officer prepared 34 bunding schemes during the year, mostly in the Dharwar and Bijapur Districts, and a deposit system has now been introduced to restrict the application to *bona fide* cases. Construction is now in progress in the case of 11 of these schemes. Although bunding has been practised by the

people for generations, it is found through the surveys made by this Officer that the designs are generally very defective owing to the bunds being constructed across the contours. Already the advantages of having the alignments laid out by an officer working with a dumpy level are becoming recognized.

Education.

33. The Poona Agricultural College which is affiliated to the Bombay University has entered its sixteenth year of existence and it is now perhaps the best known Agricultural College in the East. This is perhaps due to the fact that the policy of this institution has been less to turn out practical farmers (for which purpose separate training is provided) than men fairly highly educated in the sciences associated with Agriculture; and in addition to this, the facilities for studying the different branches of Agriculture are perhaps wider than what are available at other similar institutions, thus there is an Imperial Service Horticultural Officer. Hence perhaps the most interesting feature about this College is the cosmopolitan character of the student population. Dr. Burns has given some interesting figures bearing on this point in his Annual Report, *vide* Appendix B. We find in fact that students are drawn from such distant parts as Burma and Ceylon, the United Provinces and Goa, the Nizam's Dominions and Mysore. Similarly the distribution of caste and race is very striking. There are Brahmins, Marathas, Lingayats, Patidars, Jains, Mohamedans, Parsis, Christians and Buddhists.

In these circumstances and because social life and sport are specially cultivated by the Principal, this College must exercise a potent unifying influence upon Young India.

34. During the year under report this College was well patronized and the number of students on the roll was 173. Each of the principal divisions of the Presidency was well represented and 23 per cent. of the students from the Bombay Presidency came from the four chief agricultural communities, *viz.*, Marathas, Lingayats, Patidars and Anavils.

At the final examination for the B. Ag. examination in March 1924, 55 passed out of 68. Of these one secured a first class, and the rest a second class.

35. The other educational work undertaken by this Department, consists of the 6 Vernacular Agricultural Schools, of which there is nothing special to report, but it

appears that those more recently started in Gujarat at Surat and Godhra are proving satisfactory. Further details will be found in the reports of the Deputy Directors, published as appendices hereto.

36. The important experiment in Vernacular primary schools of introducing an alternative course in the higher standards qualifying for the alternative Vernacular (Agricultural) Final Examination, was launched in the year under report when 17 masters completed their training and took over their duties. The special training of those teachers is in the hands of the Agricultural Department, and it is now possible to form a preliminary opinion upon the success of the training. It appears from the inspection reports of the Inspector of Schools that this has not been quite so adequate as is desirable. It appears essential that no effort should be spared to make this training as efficient as possible and it would in my opinion be worthwhile to put the very best available officer in this Department, having the necessary qualifications, on special duty to conduct this training personally. Proposals to this effect have been submitted to Government.

Statistics.

37. This branch has been very fully occupied in compiling the revision of the Statistical Atlas, Bombay Presidency. This is now with the publisher and it is hoped that it will soon be out. Dr. Mann, permanent Director of Agriculture, has given great attention to improving the general presentation of the statistics, and by the free use of modern methods of illustration he has effected a great improvement upon the last edition which was published 20 years ago.

Publications.

38. In addition to these two publications the Department has published during the year under report the following memoirs, bulletins and leaflets.

Memoirs.

1. Memoirs of the Department of Agriculture in India, Vol. XII No. 5, March 1924.

   Studies in Gujarat Cottons, Part II, by Maganlal L. Patel, B.Ag.

Bulletins.

(1) No. 113 of 1923. Year Book of the Agricultural Department in Sind.

(2) No. 114 of 1923 (Technical series No. I). Studies on the Rice Plant and Rice Cultivation.

(3) No. 115 of 1924. Shevri as a fodder crop.

Leaflets (with Vernacular versions).

No. 8 of 1923. Sulphate of Ammonia.

No. 1 of 1924. Improved strains of Kolamba Rice for the North Konkan or Thana and Kolaba Districts.

No. 2 of 1924. Castor cake—A Manure of the cotton crop in Khandesh.

No. 3 of 1924. Red Mauritius variety of sugarcane in Kanara and in Konkan generally.

No. 4 of 1924. Improved varities of Tomatoes.

No. 5 of 1924. Spraying against plant pests with Insecticides.

FINANCE.

39. The expenditure of this Department which fell from Rs. 19,50,254 in 1921-22 to Rs. 14,77,950 in 1922-23, recovered to Rs. 15,12,250 in 1923-24. The former figure, however, was swollen by about Rs. 1,36,304 owing to retrospective effect being given to revision of pay.

The receipts rose from Rs. 2,96,000 in 1922-23 to Rs. 3,39,000 in 1923-24.

As regards the Personal Ledger Account which is used for financing seed, &c., the total amount advanced was Rs. 2,09,408 and the total amount recredited within the year was Rs. 1,51,889. Various schemes financed from the Sir Sassoon David Trust were in progress from funds already received.

The subsidy from the Indian Central Cotton Committee amounted to Rs. 30,870, of which Rs. 27,175 was spent during the year.

40. It is no exaggeration to say that finance is the most formidable administrative problem confronting the Department of Agriculture to-day. The Department has been in existence long enough for an estimate to be formed

of the value of its services to Agriculture and the Country and still more of its potential value. We are now faced with unlimited opportunities for useful expansion in the spheres of

(I) Research and Experiment.

(II) Propaganda and Service.

In paras. 2 to 21 and more particularly in para. 9 of this report I have summarised the main pieces of research which are in progress; but it is obvious that these are only a sample of the vast number of problems which could profitably be investigated. Similarly the amount of propaganda and service which the Department is undertaking is only a small fraction of what could usefully be undertaken. On the other hand the Departmental budget cannot be expanded indefinitely out of Provincial Revenues, and moreover, this latter method which is the only method at present in force, of financing the Department, is defective in one very important respect. The grants are liable to be heavily cut to cope with periods of depression and consequent retrenchment policy. Thus the Agricultural Department grant of 1922-23 was cut by nearly Rs. 3½ lakhs or 22 per cent. as compared with that of 1921-22, owing to temporary financial stringency. Scientific work cannot be economically carried on unless it is pushed through to completion. A break at any stage means, in considerable degree, a new beginning.

41. In these circumstances it seems highly desirable to devise some means of facilitating the wide expansion of the work of the Department and at the same time of securing uninterrupted progress by, at least in part, eliminating the exigencies of the Provincial Budget.

One method of giving effect to this idea, would be to build up an "Agricultural Improvement Endowment Fund" which would be invested and administered by Trustees with the Hon'ble Minister for Agriculture as the Ex-Officio President. This fund might be created in the first place, out of the earnings of the Department of Agriculture. These amount to Rs. 3 lakhs or more per annum and are purely incidental to the operations conducted and are not the result of an earning policy. The loss of this sum to the Provincial Revenues would not have much financial significance to the State but the gain to the Department of Agriculture would be very material. In the first year the interest would amount

to Rs. 15,000 or Rs. 20,000 and in five years time the annual interest would approach a lakh of rupees. The income would in fact, be cumulative and would, therefore, provide for a process of continuous expansion of the research programme of the Department.

42. If such a fund existed it would probably be advisable to confine its expenditure to research and the application of its fruits in practice, retaining the ordinary Departmental Budget grant for financing the permanent organization of the Department embracing the salaries of the Services and the maintenance of the institutions such as the Poona Agricultural College and the Experimental Stations at Surat, Dharwar and elsewhere. This Budget grant could be kept within reasonable limits if all the special research schemes and consequent propaganda work were put on a temporary footing and financed from the Endowment Fund. In this way it would be possible to prevent the creation of a huge permanent personnel within the Department.

43. As regards the problem of financing propaganda and service to the public, there is already a subsidy scheme in force in connection with the Taluka Development Associations. The arrangement is that Government provides a sum equal to that raised locally, subject to a limit of Rs. 1,000 or in some cases Rs. 2,000 per annum. The unsatisfactory feature about this scheme, is that the local funds have to be raised by voluntary subscription and hence are liable to fluctuate widely from year to year. The amounts collected also appear to depend very largely upon the influence and power of the officials who are promoting these Associations.

It seems eminently desirable to devise a better method of raising local contributions, and I think the amounts should be provided out of the Taluka Cess, increasing the latter by a small fraction, if necessary. In view of the fact that Government gives a half share subsidy this idea should not prove altogether unacceptable to at least a certain number of talukas.

44. It would of course be necessary to prevent the development work becoming too officialised and perhaps the most appropriate way to administer the funds would be by re-constituting the Taluka Development Association as follows :—

(I) Half the members to be nominated by the Taluka Local Board.

(II) Half to be non-officials nominated by Government.

(III) The ex-officio president to be the president of the Taluka Local Board for the time being.

ADMINISTRATION.

45. In the year under report there were the usual transfers and postings of the personnel of the services owing to leave and other vacancies. The most important of these were—

(1) The permanent Director of Agriculture, Dr. Mann, proceeded on $6\frac{1}{2}$ months leave in April 1924.

(2) Mr. Gilbert became Deputy Director of Agriculture in Sind on his return from leave in February 1924 *vice* Mr. Main who had proceeded on leave in November 1923.

(3) Mr. Bruen proceeded on deputation to the Government of India in April 1924 to act as Imperial Dairy Expert.

(4) Mr. Jenkins proceeded on long leave in May 1924.

(5) Mr. B. S. Patel is acting as Deputy Director of Agriculture for Animal Breeding *vice* Mr. Bruen.

(6) Mr. Gokhale is acting as Professor of Agriculture *vice* Mr. B. S. Patel.

Messrs. C. S. Patel and K. M. Powar of the Bombay Provincial Agricultural Service are acting as Deputy Directors in the N. C. D. and Konkan respectively, and Mr. Salimath of the Upper Subordinate Service continues to act as Deputy Director in the Southern Division.

Another matter to be mentioned here is the revival of the post of Inspector of Agricultural Schools which was kept in abeyance for two years. Mr. R. Y. Hulkoti is acting in this appointment.

46. The time has now arrived in the life of this Department when some of its original and most conspicuous officers have come to the end of their service and proceeded into retirement with the good wishes of all who served with them and under them.

Professor J. B. Knight has already been absent from India for over two years but his actual retirement took place with effect from the 19th April 1924. Professor Knight will always be remembered as one of the founders of the Poona Agricultural College ; and previous to the close of 1905 before the present fine building was complete he practically carried the entire burden of the teaching of all sections, save Botany, on his shoulders ; and it is greatly to his credit that some of the best officers in the Department today, were students of the College at that period.

Rao Sahib M. L. Kulkarni has also retired with effect from 1st April 1924 and his service history affords an impressive example of what can be achieved by a man of energy who believes in, and acts upon the principle of self-dependence. He joined the Department over 30 years ago in a very humble capacity ; and for several years his salary was only Rs. 20 per mensem. He was fortunate in coming under Mr. Mollison, the then Deputy Director and late Inspector General of Agriculture with the Government of India. Mr. Mollison took some trouble in training this man which was well repaid as Rao Sahib Kulkarni rapidly rose through various appointments to Superintendent of the Dharwar Experimental Station and Divisional Superintendent of Agriculture, finally acting in the Indian Agricultural Service as Deputy Director of Agriculture for six years and retiring with the latter rank. Rao Sahib Kulkarni's name will always be associated with the Department's organization in the Dharwar area and more particularly with the introduction of improved cottons and their advantageous sales through the adoption of a system of grading based on ginning percentage.

Poona :
September 11, 1924.

T. F. MAIN,
Ag. Director of Agriculture.

APPENDIX A.

List of Taluka Development Associations organized up to date.

According to the scheme laid down in Government Resolution No. 3378, dated 5th June 1922, Revenue Department, 38 Taluka Development Associations have been formed until now as shown below :—

Gujarat Division.		
Surat District	...	1
Khandesh and Nasik Districts.		
East Khandesh District	...	4
West do. do.	...	2
Nasik do.	...	3
South Central Division.		
Poona District	...	1
Sholapur do.	...	2
Satara do.	...	2
Southern Division.		
Belgaum District	...	3
Bijapur do.	...	1
Dharwar do.	...	3
Konkan Division.		
Kanara District	...	2
Ratnagiri do.	...	3
Kolaba do.	...	1
Thana do.	...	2
Sind Division.		
Hyderabad District	...	3
Nawabshah do.	...	1
Larkana do.	...	2
Sukkur do.	...	2
		38

Out of the 38 Associations, 11 were formed in the year 1922-23 in the following Talukas :—

(1) Chorasi (Surat), (2) Pachora and (3) Jalgaon (East Khandesh), (4) Madha (Sholapur), (5) Satara, (6) Khed (Poona), (7) Dharwar, (8) Ron and (9) Gadag (Dharwar), (10) Chikodi and Athani (Belgaum).

The remaining 27 Associations have been formed during the year 1923-24 in the following Talukas :—

East Khandesh District.

1. Taluka Bhusawal.
2. Do. Raver.

West Khandesh District.

3. Taluka Dhulia.
4. Do. Nandurbar.

Nasik District.

5. Taluka Nasik.
6. Kadwa Canal Development Association.
   Ojhar Tambat.
7. Taluka Satana.

Sholapur District.

8. Taluka Sholapur.

Satara District.

9. Taluka Islampur.

Belgaum District.

10. Taluka Gokak.

Bijapur District.

11. Taluka Indi.

Thana District.

12. Taluka Mahim.
13. Do. Kalyan.

Kolaba District.

14. Taluka Alibag.

Ratnagiri District.

15. Taluka Dapoli.
16. Do. Ratnagiri.
17. Do. Rajapur.

Kanara District.

18. Taluka Sirsi.
19. Do. Karwar.

(*Sind Division*) *Hyderabad District.*

20. Taluka Hyderabad.
21. Do. Hala.
22. Do. Tando Allahyar.

Nawabshah District.

23 Taluka Shahdadpur.

Larkana District.

24. Taluka Larkana.
25. Do. Kambar.

Sukkur District.

26. Taluka Sukkur.
27. Do. Ghotki.

Subsidies amounting to Rs. 23,582 have been paid to all the above Associations during the year 1923-24 except the following:—

1. Raver.
2. Nandurbar.
3. Nasik.
4. Ojhar Tambat.
5. Kalyan.
6. Rajapur.
7. Satara.
8. Gadag.
9. Ron.
10. Dharwar.

26 Associations have been registered under the Co-operative Societies Act.

APPENDIX B.

ANNUAL REPORT OF THE COLLEGE OF AGRICULTURE, POONA, FOR THE YEAR 1923-1924.

This is the sixteenth year of the existence of the College. No Bombay students have been excluded in favour of those outside the Presidency. The present rule is to admit men from outside the Presidency, if there are vacancies after all the Bombay demands are met.

Land Acquisition.

About 73 acres of new land were acquired during the year. This brings up the College area to 300 acres. All the land except the village (Fatak Wadi) near the railway gate has now been acquired and fenced during the year under report.

Staff.

I was in charge of the College as acting Principal throughout the year. In May 1924, I was made permanent as Principal with retrospective effect from 31st May 1922.

On the retirement of Professor Knight in April 1924, Professor Patel was made permanent as Professor of Agriculture. Later he was appointed to act as Deputy Director of Agriculture for Animal Husbandry in place of Mr. Bruen who went to Bangalore as acting Imperial Dairy Expert. Mr. V. G. Gokhale, Deputy Director of Agriculture, Konkan, was appointed to act as Professor of Agriculture and took charge on 10th June 1924.

In September 1923, two of our College Staff were transferred to hold responsible research posts at Research Stations financed by the Central Cotton Committee. Mr. Ramrao Kasargode, Assistant Professor of Entomology, went to Surat as Cotton Entomologist and Mr. G. S. Kulkarni went to Dharwar as Cotton Mycologist. Mr. G. S. Kulkarni had previously been appointed acting Plant Pathologist to the Government of Bombay.

Mr. Jhaveri, Entomological Assistant, Surat, was appointed to take the place of Mr. Ramrao as Assistant Professor of Entomology. He joined in October but unfortunately met with an accident in November and had to remain on leave till about the end of May during which time Mr. V. G. Deshpande acted in his place. Mr. Jhaveri has now resumed his duties.

Mr. Baluch, Assistant Professor of Dairying and Manager of the College Dairy, was deputed for further training in dairying to Bangalore in December and Mr. M. M. Desai from North Gujarat was appointed to act in his place from the beginning of January.

Optionals.

The Senior B.Ag. students elected optionals as follows:—

	No.
(*a*) Agricultural Economics, Land Development and Intensive farming.	25
(*b*) Advanced Botany ...	15
(*c*) Advanced Chemistry ...	3
(*d*) Stock Breeding, Feeding and Management including Dairying.	8
(*e*) Advanced Entomology ...	3
Total ...	54

Examinations.

Of the sixty-eight candidates who appeared for the B.Ag. Examination in March 1924, fifty-five passed, one of them in the First Class and the rest in the second class.

Forty-six students were sent up for the I.Ag. Examination. Of these two passed in the first class and thirty in the second class. One of these thirty men has to take an examination in one subject with the I.Ag. but is allowed to keep terms with Jr. B.Ag. men.

At the final College examination for the Diploma two men appeared out of whom one was granted the Diploma. Four students appeared for the first examination for the Diploma and passed.

Students.

As usual the College Census was taken at the end of June, one month after the opening of the College. This is a convenient date for statistical purposes, as the College population settles down by that time. A few changes in the student population take place thereafter.

It has been our experience in previous years, that a man applies for admission to the College and is admitted, and that many of these admitted men do not join.

An admission fee of Rs. 5 was this year, therefore, demanded with the application for admission and ninety-three men were so admitted to the College. Out of these the number on the roll at present is seventy. Some of the men thus admitted did not join, and a few left after joining.

Besides the above number, five men who are teachers in the Cochin State, Education Department, have been directly admitted to the second year of the Diploma Course at the request of their Director of Agriculture. The men are qualified science graduates.

The total number of men admitted this year, therefore, is seventy-five. This number of admission is the officially sanctioned number.

Short Course.

Men who wish one year's training mainly in practical agriculture with a small amount of training in the allied sciences to enable

them to grasp the principles underlying agricultural practice are admitted to this course. We admitted twelve men this year out of whom five failed to come. There are, therefore, seven men in the class including a Veterinary Graduate from Bombay.

Special Courses.

A few students are also taken up every year to take up special courses in any particular branch of science allied to agriculture. We have three such men this year. One of them, a Jamadar Ramji Lal, was deputed by the Officer Commanding the Indian Army School of Education, Belgaum, to take up courses in agriculture and allied sciences for a period of a month and half. One Mr. Vartak was allowed to take up a course in Agricultural Chemistry and the Kumar from Orissa who was in the short course class last year has been allowed to take up a further agricultural course.

Details of all students for the last eight years appear below :—

Details of Students.	1917.	1918.	1919.	1920.	1921.	1922.	1923.	1924.
First year students ...	58	61	60	89	84	67	51	70
Second year students ...	36	39	46	50	53	65	49	39
Third year students ...	23	35	38	48	49	57	61	54
Short course students ...	...	...	23	12	18	...	5	7
Special course students ...	7	2	3	4	6	5	4	3
Total ...	124	137	170	203	205	195	170	173

The statement below gives the localities from which our students are drawn :—

Locality.	1917.	1918.	1919.	1920.	1921.	1922.	1923.	1924.
Deccan and Khandesh ...	8	19	27	38	29	29	28	38
Southern Maratha Country and Konkan.	50	42	49	52	53	56	46	42
Gujarat ...	36	36	43	40	38	34	33	36
Sind ...	9	7	7	6	7	2	6	7
Assam ...	1	1	3	1	1	1	3	...
Central India ...	1	3	...	4	2	2	3	5
Nizam's Dominions ...	6	6	8	7	6	4	5	3
South India and Ceylon ...	5	13	16	23	18	10	14	19
Burma ...	5	6	7	19	30	32	17	9
United Province ...	2	2	1	2	...	...	...	...
Berar ...	...	1	...	...	2	3	2	2
Bengal ...	...	1	4	7	8	6	2	2
Central Province ...	...	...	5	4	4	3	3	2
Nepal ...	...	...	...	...	1	1	1	...
Idar State ...	...	...	...	...	3	...	...	1
Madras ...	...	...	...	...	3	10	2	...
Ajmer ...	...	...	...	...	1	1	...	2
Udaipur ...	...	...	...	...	...	...	1	...
Travancore ...	...	...	...	...	...	...	1	...
Goa ...	...	...	...	...	...	...	3	2
Mysore ...	...	...	...	...	...	...	...	1
Mesopotamia ...	...	...	...	...	...	...	...	1
Persia ...	...	...	...	...	...	...	...	1
Total ...	124	137	170	203	205	194	170	173

Classification of the students according to communities:—

	1917.	1918.	1919.	1920.	1921.	1922.	1923.	1924.
Brahmins ...	55	61	68	84	76	84	69	73
Marathas ...	4	6	16	20	21	21	15	14
Lingayats ...	2	2	1	5	10	7	4	3
Patidars (Gujarat) ...	10	13	12	7	5	4	7	8
Jains ...	...	...	6	4	1	2	2	2
Mahomedans ...	8	4	9	12	15	8	10	9
Parsis ...	12	7	5	5	2	3	4	6
Christians ...	...	...	7	16	21	20	14	12
Ceylon students ...	...	...	6	7	2	2	...	3
Budhists ...	...	...	7	9	16	17	12	9
Anavils (Surat) ...	...	...	...	...	2	3	...	2
Others ...	33	44	33	34	34	23	33	32
Total ...	124	137	170	203	205	194	170	173

Further classification shows that out of 118 students from the Bombay Presidency (including Sind) 27 (or 22·89 per cent.) come from the four chief Agricultural Communities of the Presidency, *viz.*, Marathas and Lingayats in the South and Patidars and Anavils in the North.

Courses.

The main course is the three years' course open to students qualified according to the rules of the Bombay University.

The Principal may also admit a few other students to the course, and the successful candidates receive the College Diploma. The total number 52, admitted in the last nine years bears the following proportion annually to the total number in the class:—

	Per cent.
1916—12 out of 54 equal to ...	22·2
1917— 3 out of 58 equal to ...	5·1
1918— 8 out of 51 equal to ...	13·1
1919— 4 out of 60 equal to ...	6·6
1920— 7 out of 89 equal to ...	7·8
1921— 1 out of 84 equal to ...	1·2
1922— 2 out of 67 equal to ...	2·9
1923— 6 out of 53 equal to ...	11·3
1924— 9 out of 70 equal to ...	12·8

As a rule students of the Presidency proper are not admitted under these special conditions unless they are deputed by a State or an Institution.

Scholarships.

The allotment during the last eight years is as under:—

Locality.	1917.	1918.	1919.	1920.	1921.	1922.	1923.	1924.
Deccan ...	3	3	5	7	4	6	4	5
Southern Maratha Country ...	7	2	4	4	2	6	3	3
Gujarat ...	3	6	3	1	2	2	5	5
Konkan ...	2	1	3	3	7	1	3	2

Library.

The Library now numbers 12,250 Volumes, out of which 20 were added in 1923-24.

Other Institutions.

The Dairy, Veterinary Hospital, Manjri Farm, Ganeshkhind Garden, &c., continue to be used for the teaching of students.

Employment Bureau.

This College functions as an Employment Bureau for its graduates and has been able to put graduates and employers (whether Government or private) in touch with one another and thus secure employment for several useful men. It is hoped that this side of our activities will develop.

The statement of passed men employed in 1922 and 1923 as far as known up to date is given below:—

Total number—38—1923.		Total number—45—1924.	
Agricultural Department, Bombay.	3	Agricultural Department, Bombay.	5
Agricultural Department, C. P.	1	State Service ...	2
State Service ...	1	Agricultural Department, Burma.	7
Agricultural Department, Burma.	8	Private Bodies ...	2
Not known ...	25	Not yet known ...	29
Total ...	38		45

Conferences.

The University appointed a Committee this year for revision of the syllabus of the agricultural course. The Committee under the

chairmanship of Dr. Mann met at the College and discussed this matter several times. The report is now before the syndicate.

In April a departmental Plant Breeders' Conference was organised and held at the College for the first time. This was of great utility to all the members who attended and certain definite lines of work and policy were decided upon.

Exhibitions.

This year the College has taken a prominent part in three exhibitions. The first of the three was held during September 1923 for the benefit of the Co-operative Conference delegates and members, when the exhibits were arranged in the College buildings and various parts of the College estate.

The second one was held in the main hall of the College in December. This consisted of the exhibits to be sent to Wembley for the British Empire Exhibition. This was open to the Poona public for three days.

During May the Indian Industries and Trade Developing Syndicate, Ltd., Karachi, held an exhibition on the Deccan Gymkhana grounds and the College put up a stall there on behalf of the Department. The Syndicate awarded a gold* medal for this. All the three exhibitions were very successful.

College Gymkhana and other Activities.

On March 15, 1924, the College suffered the loss of a friend in Mr. Garland Craig, General Secretary of the Y. M. C. A. in Poona, who died of smallpox. During the whole of his service in Poona Mr. Craig had been in close touch with our students. He helped in their games, and put his own tennis court at their disposal. He was many times appealed to for all sorts of assistance and one of his last acts was to motor some of our students to the Sassoon Hospital in the middle of the night. These men had been accidentally poisoned and immediate transport to the Hospital was essential. They all recovered. In addition Mr. Craig had many friendly meetings of students and their friends in his house, and was a frequent and welcome guest at College functions. Students and staff attended his funeral and subscribed to a brass plate in his memory, which plate has been put on the walls of the College Hall, the shrine of our traditions.

Mr. Craig's successor, Mr. Perry Park, has already made himself well known among our students, and it is to his inspiration particularly that volley-ball and basket-ball are being played with unusual vigour and expertness. The value of these open-air group games is inestimable.

* This was not actually received as we were supposed to pay for it.

The College platoon of the University Training Corps for the second time won the Inter-Platoon shooting shield. The platoon continues at full streng h. This College has no less than four officers of the University Training Corps on its staff.

In the Intercollegiate Sports we carried off five cups, coming third among the Colleges. This is an honourable place, considering how small a number of men we have to draw on compared with the Arts Colleges.

The various departments of the College Gymkhana have been well patronised in their respective seasons. We had a fair cricket team and some excellent tennis players. Hockey and foot-ball were fairly attended. In the latter game we feel the loss of many of our Burman students, who played this game well.

The Students' Union, an unofficial body representing students interests and largely occupied in organising social intercourse, has this year for the first time a student president. It had, up to date, one of the staff as a president. This now autonomous student body continues to fulfil most useful functions and to be a great help to the life of the College.

Among our distinguished visitors during the year were (1) Sir Mahadeo Chaubal, (2) Mr. Street, Joint Secretary, Royal Services Commission and (3) Dr. McRae, Imperial Mycologist, Pusa.

The *esprit de* corps of the College grows daily, and the twin ideals of the College, science and sport, continue to be pursued with increasing eagerness. With this spirit we hope to produce not only good farmers but also good citizens.

College Veterinary Hospital.

During the year under report the following processes have been increasingly employed with excellent results :—

(1) Drenching animals by nasal route by a single india-rubber tube. Bottle drenching has been given up in most cases.

(2) The method of castration by Burdizzo's Castrator has been a great success. Cultivators in several districts have adopted this without objection.

(3) Gastro-intestinal Lavage has been a great success. Dog owners have very much appreciated this method.

The treatment of Rinderpest by iodine, that of Tetanus by carbolic acid and the use of potassium permanganate in veterinary practice have been newly introduced this year.

The details of the working of College Veterinary Hospital are given below :—

Statement showing the details of the working of the Agricultural College Veterinary Hospital, Bhamburda, Poona, for the year 1923-1924.

Patients treated, &c.	1921-22.	1922-23.	1923-24.	Remarks.
Total ...	2,419	2,714	4,537	
Inpatients ...	514	460	484	
Outpatients ...	1,617	2,160	3,787	
Patients treated on tour ...	176	69	167	
„ supplied with medicine ...	112	85	99	
Daily average attendance of ...	41·57	39·25	46·30	
„ „ „ „ inpatients ...	24·08	16·66	19·72	
„ „ „ „ outpatients..	17·49	22·51	25·66	
Free patients ...	1,032	1,252	1,808	
Paid patients ...	1,099	1,278	1,479	
Agricultural animals ...	448	437	617	
Non-agricultural animals ...	1,603	815	1,191	
Castrations performed ...	99	63	87	
Attendance on Rinderpest ...	10	6	6	
„ „ foot and mouth ...	10	3	5	
„ „ black quarter ..	...	2	1	
„ „ Hemorrhagic Septicæmia.	1	...	3	
„ „ Glanders ...	1	...	...	
„ „ Epizootic Lymphangitis.	1	...	1	
„ „ Fowl Cholera ...	1	...	...	
„ „ Pneumo-pericarditis ...	1	...	...	
Inoculations performed ..	154	256	929	

W. BURNS,

Principal,
Agricultural College, Poona.

APPENDIX C.

Summary of Work done under the Deputy Director of Agriculture, North Central Division, Nasik, 1923-24.

Staff and Organization.

1. Mr. W. J. Jenkins was in charge of the Division till 8th May 1924 when he went on long leave and I took over charge from him. Amongst the subordinate staff there was no important change except that Mr. R. B. Nimbalkar, Head Master of the Dhulia Vernacular Agricultural School, was transferred to Jambhul Vernacular Agricultural School and his place taken over by Mr. J. N. Purandhare.

2. In view of the suggestions made by the Registrar, Co-operative Societies, Poona and the Director of Agriculture, Poona, the district staff of the division was re-arranged on a territorial basis so that the work of any two officers may not over-lap and more intensive propaganda may result. This scheme was put into force at the end of the year in May 1924 and it is expected it will result in more intensive and efficient work. According to this scheme the 3 districts of this Division are sub-divided into 9 sections each containing from 2 to 4 talukas and each section is put in charge of a Non-Graduate fieldman or District Agricultural Overseer according to the importance of the work and strength of the available staff. It may be mentioned here that the staff both interior and superior available in this Division is too small to cover all the talukas of the Division and hence the work in 6 talukas out of 33 in the Division is left out altogether, while some of the sections will have to be left only in charge of Kamgars.

3. As per orders contained in Government Resolution, R. D., No. 4541, dated 23rd January 1924, the Dhulia Farm was converted into a Vernacular Agricultural School and it is now being accommodated on the Farm by making suitable additions and alterations in the existing buildings. Thus the Farm will in future serve the purpose of the School in addition to the Cotton Breeding operations which are carried on there under the Cotton Breeder.

4. The Divisional Board of Agriculture, N. C. D., held four sittings during the year at Jalgaon, Nandurbar, Bhusawal and Nasik and it is gratifying to note that this peripatetic system of holding its sittings at different centres has resulted in making its powers and usefulness more public and popular and is always attended by a large number of visitors who take keen interest in the work of the Agricultural and Co-operative Departments. Since its inception, in all, eight meetings have been held and it may congratulate itself that there are now ten Taluka Development Associations in the Division and besides it can lay to its credit much useful work in considering schemes of tagavi loans, non-credit societies, cotton sale and seed societies and many questions affecting the general welfare

of the agriculturists of the Division. The members have continued to take unabated interest in the deliberations of the Board and during the year the following members constituted it:—

Mr. W. J. Jenkins, Deputy Director of Agriculture, N. C. D., (Chairman).

,, L. S. Potnis, Assistant Registrar, Co-operative Societies, Bombay (5th meeting at Jalgaon).

,, A. C. Desai, do. (6, 7 and 8th meetings).

,, B. R. Ransing, Dhulia, West Khandesh District.

,, S. B. Deshmukh, Pimpalner, West Khandesh.

,, P. M. Bildikar, Pachora, East Khandesh.

,, A. V. Patil, Satana, Nasik.

Rao Saheb Rupchand Motiram. Jalgaon, East Khandesh. } Cotton Industry.

,, ,, Gulabchand Hiralal, Dhulia, West Khandesh. } Cotton Industry.

5. A conference of the members of the staff was held on 28th April 1924 at Nasik when many important Agricultural problems of the Division were discussed and the programme for the next season's work was drawn up after mutual inter-charge of ideas and experience.

Season.

6. Monsoon set in late at the close of the month of June and the Kharif sowings were completed during the first half of July. During the later part of July there were heavy rains in many parts of East Khandesh which spoiled the germinating cotton crop. In parts of West Khandesh and Nasik the rainfall was below normal and caused scarcity of fodder in many places. There was a long break from the middle of August to the middle of September when good rain fell, which eased the situation to a great extent both in Khandesh and Nasik. There was little rain in October; but there was a specially hot spell in this month which affected the cotton crop adversely and the prospects for Rabi crops were not good. The cold weather was not normal, there being less of cold and absence of dew. The effect on the crops was that both Kharif and Rabi crops came to below normal in both Khandesh and Nasik.

Farm Section.

7. *Jalgaon Farm.*—In spite of the adverse conditions of the season the cotton crop of the Farm came out normal due to careful tillage during the break from mid August to mid September and the average yield was 603 lbs. per acre from a total area of 128 acres 14 gunthas under this crop. The total quantity of N. R. seed obtained from this was 42,012 lbs. of which 39,000 lbs. was handed over to the Cotton Supervisor for distribution in the District.

8. The Mahua cake was again tried to compare with castor cake; but the results were not conclusive; however, in view of the fact that Mahua cake is not obtainable in large quantities and is slow in effect it was decided to abandon further trials.

9. The experiment to see if nitrate of soda can be utilised as a top-dressing to prevent wilt was again tried during this year but the results were not favourable and it has been abandoned.

10. Castor cake as manure for cotton is getting more and more popular and in proportion to the demand the prices are also rising. The usual dose adopted on the Farm and recommended is 400 lbs. per acre. In order to see if the dose can be reduced to 300 lbs. due to high prices, comparative plots manured with 400 lbs. and 300 lbs. per acre were laid out and the results of the past two seasons show that the dose can be ecomomically reduced to 300 lbs. and this is now being recommended to the cultivators.

11. Groundnut crop suffered from excessive rains of July in the beginning and did not recover entirely from this effect in the long run. However, an average yield of 1,135 lbs. was obtained from a total area of 25 acres and 38 gunthas.

12. Jowar and Udid mixture occupied an area of 18 acres and 36 gunthas and in spite of adverse conditions of the season excellent crop was obtained with an average yield of 1,115 lbs. of Jowar and 425 lbs. of Udid per acre.

13. The total area under Rabi crops was 19 acres and 38 gunthas of which 16 acres and 38 gunthas were under wheat, 2 acres under gram and 1 acre under coriander. The wheat crop was below normal with an average yield of 650 lbs. per acre while gram and coriander did fair with a yield of 560 lbs. and 480 lbs. per acre respectively.

14. The Farm, besides having served as a central seed farm for N. R. Cotton seed in the Division, is always a centre of various activities. It has an implement depot which recovered Rs. 407-1-0 as hire and sold miscellaneous implements and parts worth Rs. 2,425-4-0. New implements are first tried on the farm and then recommended in the district. Besides, implements from several firms are stocked on consignment account for sale. During the year Skeen's bucket water lift was tried. A demonstration was held on 13th and 14th September when many cultivators attended it.

15. The farm is run on business lines and serves as a centre for training apprentices. To enlarge its usefulness in this direction it is settled to take in Agricultural Graduates for post training in Farm management. Last year there were some applicants for admission but due to want of housing accommodation no students came in. Now accommodation for three students has been made by erecting kacha huts and a curriculum has been settled for intending students and publicity is being given to this. Students will only be attracted for this training if big land-lords and Jahagirdars realise the usefulness of engaging trained men for estate management.

16. The total receipts during the year were Rs. 28,746-7-8 against the total expenditure, including pay, &c., of the staff, of Rs. 21,997-4-2. Due to recent retrenchment the contingent grants of the farm have been cut down too low which tell upon the efficient management of the farm, but it is hoped it will be recouped soon.

17. *Dhulia Farm.*—As stated above in para. 3, the farm is now converted into an Agricultural School and in future it will serve as a demonstration plot for training the students and a cotton breeding centre for Khandesh. During the year under report large portion of the area was under different strains of cottons segregated by the Cotton Breeder for studies and multiplication. As mentioned in para. 19 of last year's report the orchard now consists only of lemons and oranges and it will be utilized to teach students in budding, grafting and general fruit culture which industry is increasing day by day in this Division.

18. *Khed Nursery.*—In view of the increasing importance of fruit-growing industry in Khandesh, a keen necessity for a good nursery was felt and this has now been met with by the offer of one acre of land at Khed by Rao Saheb Gulabchand of Dhulia from his garden there as stated in para. 19 of last year's report A Horticultural Fieldman is now stationed there and a beginning made by planting Jamburi seedlings in about 4 gunthas which will give about 2,000 seedlings next year for grafting. Arrangements are being made to put this work on a more systematic basis.

19. *Belgaon plot.*—In Nasik District, there is no departmental plot and consequently a great handi-cap was felt in making preliminary trials and experiments which could not be made on cultivators' filed satisfactorily. This want has now been met with by the offer of 5 acres of land by Mr. Jategaonkar of Belgaon near Nasik as stated in para. 7 (*b*) of last year's report. A Kamgar has been posted there and during the year under report several experiments with wheat, chillies, potatoes, Bhendee (Ladies fingers), &c. were carried out.

Potatoes as a Kharif crop were tried and a yield of 2,320 lbs. per acre was obtained though the season was not favourable. There are several tracts in the District where this crop is likely to be successful and plots on cultivator's field are being laid out for demonstration.

There is a small silo which was filled in with 22,500 lbs. of green grass. Nearly 13,000 lbs. of ensilage was procured from it. Skeen's bucket water-lift was tried and demonstrated.

Research and experiments on crops.

20. (*a*) A committee of Drs. Mann, Burn, Messrs. Jenkins, Prayag, and M. L. Patel was held in October 1923 to settle out the lines of work in cotton breeding in Khandesh and as a result of their deliberations it was settled that the object of cotton breeding work

in Khandesh was the discovery of higher yielding, higher ginning, and longer stapled types of cotton suitable for the tract, the order of importance of the characters being as above set out. In view of the above policy the following work was undertaken during the year :—

(1) Studies of 9 strains in Bani-Comilla hybrid.
(2) Studies of the promising strains in N. R. and N. V.
(3) Studies of Cernum-Indicum crosses from Nagpur.
(4) Studies of Neglectum types from Cawnpur.
(5) Studies of Bishnor Jari and Bani 315.

Many types imported from outside were impure and pure strains are being segregated for further studies and cross-fertilisation work. In all the Cotton Breeder had 1,642 plants under observation and studies and it is hoped to issue these observations and studies in the form of a memoir when suitable material is collected.

BXX 27, one of the promising strains of Bani Comilla hybrid was tried at Jalgaon in 2½ gunthas plots in comparison with N. R. and in yield and ginning percentage it was found superior to N. R. It is being arranged to sow this on a two acre plot on the Jalgaon Farm for further comparison and seed multiplication.

(*b*) To demonstrate the use of castor cake as manure for cotton several plots were laid out all over the cotton tract. The crop was treated in doses of 400 lbs. and 300 lbs. per acre and the results obtained were very convincing except in West Khandesh where due to shortage of rain-fall the crop did not come out satisfactorily. In East Khandesh, blood manure, which is available in limited quantities at Bandra slaughter-house, about 5,000 bags a year, was tried in doses of 100, 150 and 200 lbs. per acre and the results showed a profit of about Rs. 50 an acre after deducting the cost of the manure. Next season it will again be tried and demonstrated.

21. *Spanish Groundnut.*—This crop has now become of great commercial importance in the Division and is fulfilling a very important position in the economic and rotational system of the tract. During the last ten years its acreage has increased from 4,100 acres in 1912-13 to 106,044 in 1922-23. Messrs. Volkart Brothers of Bombay brought to the notice of the Department that the crop was deteriorating in quality. An enquiry was made regarding this but it was found that the quality had deteriorated due to adverse conditions of the seasons and that wherever the seasonal conditions were favourable, the produce was of good quality. However, a fresh stock of seed was obtained from the United States of America and it was tried on the Dhulia and the Jalgaon Farms. So far the observations went the fresh seed did not turn out superior to the local acclimatised seed. However, this will be watched in future and attempts will be made to renovate the seed if necessary

22. *Wheat.*—This crop occupies a large and important area in the Nasik District and varietal and manurial experiments were tried

at several places; but due to adverse conditions of the season the results were not conclusive.

In West Khandesh, manurial experiments with castor cake, sodium nitrate, &c., on wheat under irrigation were carried out and the results obtained were very promising. They are tabulated below:—

Serial No.	Treatment.	Yield per acre.		Remarks.
		Grain lbs.	Chaff lbs.	
1	No manure ...	928	1,780	After deducting the cost of manure, the profits from extra yields come to Rs. 30 to 40 per acre.
2	300 lbs castor cake per acre ...	1,213	2,800	
3	150 lbs. sodium nitrate per acre ...	1,322	3,066	
4	Complete manure ...	1,534	4,133	
	112 lbs. ammonium sulphate ...			
	224 lbs. super phosphate ...			
	300 lbs. castor cake ...			

23. *Bajri.*—The Akola Bajri is getting more and more popular and large quantities are now imported by cultivators for seed purposes in the Division. It is observed that it gets deteriorated by cross-fertilization in a short time and fresh seed is to be imported every now and then. However, as the yield is very much higher than that of the local, people do not grudge the extra cost of transport and the demand is increasing.

24. *Rice.*—In western parts of the Nasik District, bordering on the Konkan, rice is an important crop and in trying to find out a suitable substitute for rab, the department has been able to demonstrate that 12 lbs. of Ammonium Sulphate applied to a guntha of seed bed, produces 20 per cent. more seedlings of very good vigour. This is being demonstrated to cultivators and during the year under report 3,300 lbs. of Ammonium Sulphate was sold in Igatpuri Taluka for this purpose.

25. *Fruits.*—Since the practice of spraying grape vines with Bordeaux mixture against grape vine mildew was introduced, the area under this fruit is increasing very steadily in the Nasik District and it now occupies an area of 1,300 acres against 336 acres in 1917-18. Manuring with Ammonium Sulphate was tried in several gardens; but the effect was not appreciable. Mr. H. V. Gole, who is a keen student of grape cultivation, is experimenting on the trailing of grape vines on simple wires instead of Pangaras. The wires were supplied some years back by the department and the results will be watched with interest.

Orange cultivation is steadily progressing in Khandesh and the establishment of the nursery at Khed will help the industry a great deal. Mr. Manakchand Kisandas of Utran in East Khandesh has planted an area of nearly 120 acres under oranges and lemons and is conducting the plantation on business lines. The Department is always in touch with him and the progress of the plantation is wached with interest and it is hoped it will be an object lesson in fruit-culture in Khandesh.

26. *Sugarcane.*—As a result of continued propaganda by the Department, there has been a great improvement in the cultural, manurial and manufacturing methods of the sugarcane industry in the Division. People now plant their canes wider and freely use Ammonium Sulphate and castor cake as manure with advantage. However, due to fall in the prices of Gul and the uncertainty of water supply in canals and wells, the area under this crop has recently decreased. Several varieties of canes were tried at Konkangaon under the Kadwa Canal and of these Manju variety appears to have some prospects, it being early and the water in the Kadwa Canal being available only for 8 months.

27. *Onions.*—This forms an important crop in parts of the Nasik District and Sodium Nitrate applied at the rate of 400 lbs. per acre gave an increased yield of 2,360 lbs. of onions per acre. Further trials with reduced doses are being laid out in the next season.

28. *Potatoes, Garlic, Chillies, &c.*—Potatoes have been recently introduced both as a Kharif and Rabi crop in Dindori and Nasik Talukas and are making a head way in suitable areas. Manurial experiments with Sodium Nitrate and castor cake on Garlic and Chillies were carried out in Nasik and Khandesh and useful results obtained to form further basis of experiments.

District Cotton Work.

29. The demand for pure N. R. seed has continued to be keen and the supply was less than demand. The consequence was that the registered seedgrowers who were given most of the fresh seed on concession rates failed to abide by the conditions by which they were to return part or whole of the seed produced by them and they made profiteering from it by selling it at exhorbitant rates. Moreover, the registered seedgrowers being scattered throughout the District, extension of N. R. seed was diffused and the absence of concentration failed to make any demonstrable increase in the area of N. R. Cotton. Again the Department had not sufficient funds to finance all the seed produced even if the seed produced by seedgrowers was made available. Under the circumstances, during the year under report a scheme was worked out in consultation with the Registrar, Co-operative Societies, by which most of the seed produced at Jalgaon and Dhulia was distributed to selected Co-operative Societies and Taluka Development Associations who gave the seed to such of their members who agreed to return half or

more quantity of seed produced to the society or association, the rate of purchase and sale being settled by the managing committees of the bodies concerned. In case of dispute the matter was to be referred to the Deputy Director of Agriculture, N. C. D., Nasik. Under this scheme 31,360 lbs. of fresh seed has been distributed to 11 Co-operative Societies and 8 Taluka Development Associations in the Division. If the scheme works satisfactorily the area of work will be centralised and the extension of N. R. will be carried out on a more systematic basis. During the year the total quantity of fresh seed from Jalgaon and Dhulia Farms available for distribution was 41,033 lbs. of which 31,360 lbs. was distributed to co-operative bodies as stated above and the remaining 9,673 lbs. was distributed to other parts of the Presidency.

30. The total quantity of second class seed procured for distribution during the year was 292,000 lbs. of which 41,700 lbs. was purchased by the Department from the Personal Ledger Account; 113,487 lbs., by co-operative banks at Dhulia and Malegaon, 87,097 lbs. by Taluka Development Associations of Jalgaon and Pachora and the remaining by the Co-operative Credit and Seed Societies. Of course all the business had to be arranged by the Department.

31. Besides the above, several reliable seedsmen and big landlords had their crops purified at their cost under Departmental supervision and they distributed nearly 75,000 lbs. of seed in their neighbourhood. If these people instead of taking to profiteering, carry on the work on more equitable lines, they will also serve a useful medium in the dissemination of the seed.

District Propaganda Work.

32. *Shows and Demonstrations.*—In addition to the several experimental and demonstrational plots laid out on the cultivators' fields as described above, under crop experiments, a large number of organised shows and demonstrations were held during the year. Amongst these, two, one at Bhadali in Jalgaon Taluka and the other at Ravalgaon in Malegaon Taluka, were of special interest. The former was organised under the auspices of the Jalgaon Taluka Development Association and attracted a large number of visitors. A series of lectures on Agricultural improvement and co-operation were arranged at this show. The other show at Ravalgaon was arranged through the generosity of Shet Walchand Hirachand on his estate where the working of tractor ploughs was specially demonstrated to a large number of visitors from the Division.

33. *Implement Depots.*—Thirteen Departmental implement depots were maintained during the year and the total revenue from these on account of hire amounted to Rs. 1,770-11-6. It has been the policy of the Department to shift these depots to new and unworked centres as soon as the recommended implements become popular and are adopted by the cultivators.

34. *Seed, Manure and Implement Distribution.*—In spite of many private agencies and organisations springing up in the Division the Department has always to meet a large number of enquiries for seed, manure and implements supply and to execute them. During the year besides the N. R. cotton seed, mentioned above the District Staff supplied nearly 20,000 lbs. of various kinds of seeds worth about Rs. 2,000. A great demand for castor cake as manure for cotton has arisen in the Division and the Department assisted in procuring and distributing nearly 125,000 lbs. of it worth something like Rs. 10,000. Besides this 25,000 lbs. of Ammonium Sulphate and other artificials worth Rs. 3,300 were distributed by the Department. Implements, mostly ploughs and cane crushing mills, worth Rs. 14,000 were purchased by the cultivators through the Departmental agency.

35. *Distribution of Copper Sulphate Packets.*—As per orders contained in Government Resolution, R. D., No. 6799, dated 19th February 1923, a special campaign was organised to make a wide spread distribution of Copper Sulphate packets for steeping jowar seed against smut in co-operation with the Revenue Department, the various Taluka Development Associations and other co-operative bodies. The Departmental Staff and the Fieldmen of the Associations were specially engaged for some time in demonstrating the steeping of jowar seed in Copper Sulphate solution and in all 12,506 packets were distributed in the Division.

Agricultural Associations and Non-credit Work.

36. *Associations.*—Since the institution of the Divisional Board and the formation of Taluka Development Agricultural Associations, considerable local interest has been aroused in the Division. There are now in all 14 Agricultural Associations of which 10 are registered or are under process of registration under the new scheme. They are situated as under:—

East Khandesh.	*West Khandesh.*	*Nasik.*
*(1) Jalgaon.	*(1) Dhulia.	*(1) Nasik.
*(2) Pachora.	*(2) Sindkheda.	*(2) Kadwa Canal.
*(3) Bhusawal.	*(3) Nandurbar.	*(3) Satana.
*(4) Raver.	(4) Shirpur.	
(5) Edlabad.		
(6) Jamner.		
(7) Chopda.		

All these Associations have their own Fieldman who is either lent by the Department till their own man is being trained by the Department or their own trained man. Their yearly programmes of work are laid out by the managing committees with the help of

* These are already registered or are under the process of registration.

the Department and they are then submitted to the Divisional Board which after scrutinising recommends for subsidy.

As a result of this new activity the work of the Department has been greatly facilitated. Most of these Associations have their own implements which are given to the cultivators of the Taluka on cheap hire. Many take up distribution of seed and manure and serve as seedgrowers for cotton seed to the Department. Several have taken up propaganda work for co-operative development both credit and non-credit. Thus their activities have given a great stimulus to agricultural and co-operative development in the Division and it is hoped if properly encouraged both by officials and non-officials, they will form a very useful link between the Agricultural and Co-operative Departments on one hand and the agricultural community on the other.

37. The Shirpur Agricultural Association in West Khandesh has got a Cattle Breeding Farm at Sangvi where a herd of 75 cows, bulls and young stock of the Tapti Khilari breed is maintained. On the recommendation of the Department, the Government sanctioned a subsidy of Rs. 800 a year, to this Association and the question of increasing the subsidy is under consideration if the Association abide by certain conditions. It is hoped, if this farm is well developed, it will serve a very useful purpose in providing pure breeding bulls in the Tapti Khilari tract.

38. Similarly the Jamner Agricultural Association in East Khandesh is maintaining a herd of about 90 cattle at Gangapuri and the question of giving a subsidy to it is under consideration. It is proposed to maintain here a pure breed of Nimari cattle. The present breed is a mixed one and the Association is being persuaded to dispose it of and maintain a pure breed of Nimari cattle.

39. In East Khandesh a District Agricultural Association has been organised as a deliberative body for considering subjects of general agricultural interest and sending the same to the Divisional Board for discussion and recommendation where necessary.

40. *Non-credit Work.*—There was a good number of seed, manure and sale societies in the Division, but most of them were in a dormant condition and several had stopped working completely. With the help of the Agricutural Organiser during the year, several have been set in motion and by now 5 seed societies have been set working and 3 new seed societies have been registered. In addition to this, proposals of a new co-operative ginning society at Kolpimpri have been sent for registration.

In future, when the Taluka Development Associations, which are registered under the Co-operative Act, are properly set in working, these will perform the major work of supply of seed, manure and implements in their respective talukas to the cultivators and thus will serve to a great extent the purpose of non-credit societies in the Division.

Agricultural Education.

41. Dhulia Agricultural School, which commenced its working last year, has been now permanently transferred to the Dhulia Farm from the City and this year it has full two-year classes. Though it has been transferred on the Dhulia Farm still great difficulty is experienced, owing to lack of proper and adequate accommodation. However, with the present arrangement the boys will have full advantage of practical work as they will be spending more time on the Farm.

42. There were 10 boys throughout the year and at the annual examination held all passed. The successful students are now undergoing the 2nd year course and a new batch of 18 students has been admitted in the 1st year, out of 36 applications received from the three districts.

Mechanical Assistance and Boring Work.

43. *Mechanical Assistance.*—The Mechanical Assistant attended to the sugarcane crushing plant at Dindori and surveyed and reported on the schemes of Pumping Installations submitted for tagai loans at different places. In addition, he paid visits to the Farms and attended to overhauls, repairs, &c., of machinery there. Besides his regular work, he has prepared a new winnowing machine which is still under a trial.

44. *Boring Work.*—During the year three machines worked in this Division; but great difficulty was experienced owing to want of fishing tools as well as high labour cost and consequent scarcity. The three machines worked in all 458 days and bored 1,069 feet. Out of 20 bores, 8 were successful during the year. There is a keen demand for these machines with power adjustment as the labour is very scarce and dear in cotton growing areas.

General.

45. *Assistance and Advice to Cultivators.*—The always increasing calls upon the services of the members of the staff for assistance and advice in manure, seed, implement, diseases of crops, &c., is cordially met with. The Department recommended to the Collector of Nasik 12 persons for giving licenses for pig killing and he has kindly granted the same.

46. *Publicity.*—A leaflet on castor cake as manure to cotton was published. Besides, the staff contributed a number of articles in Shetki and Shetkari, College magazine and other local news papers. A large number of notes and articles were submitted to the recently organised Publicity Committee. In short, every effort was made to make the work of the Department as widely known as possible.

47. *Help from Revenue and other Officers.*—The Department received cordial help from the Revenue authorities of the Division

and in fact the vitality of most of the Agricultural Associations in the Division is due to their cordial co-operation and support.

48. *Fieldman's Class.*—At the request of the Pachora Taluka Development Association a Fieldman's class was organised on the Jalgaon Farm where the Fieldmen of the Taluka Development Associations of the Division were trained in the work which they have to perform.

49. *Propaganda Meetings.*—Members in their tours organised meetings and delivered lectures on suitable subjects. During the year 70 such meetings were organised.

Personal.

50. I am sure the work of Agricultural improvement and organisation has made a very good progress in the Division and all the staff have put in a good year's work. It is invidious to make mention of names when all have done so well. However, I must mention the name of Mr. N. V. Bhagwat, the District Agricultural Overseer, Nasik, who took a very prominent part in organising three Taluka Development Associations in the Nasik District where no sort of Agricultural Organization existed before.

G. S. PATEL,
Deputy Director of Agriculture,
N. C. D., Nasik.

APPENDIX D.

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF AGRICULTURE, SOUTH-CENTRAL DIVISION, POONA, FOR THE YEAR 1923-24.

Staff and Organisation.

1. I continued to be in charge of the Division throughout the year except one month and ten days from 22nd April 1924 when Mr. K. M. Pawar, B.Ag., acted for me, Mr. M. G. Athalye, L.Ag., Divisional Superintendent of Agriculture, Deccan Canals, was on leave from 12th November 1923 to 15th May 1924. Mr. K. M. Pawar acted for him. There were some minor changes in the subordinate staff. Two posts of graduate fieldmen under training are allotted to this Division during the year owing to the increased work. A staff conference of the District Agricultural officers was held in April 1923. It had considered the lines of work and the policy regarding the introduction of the recommendations of the Department, the ways of securing the co-operation of the people and of the district officers of the Revenue and Irrigation Departments. The work was carried out in pursuance of the resolutions.

2. *Lines of Work.*—The work during the year was continued and developed on the lines as in the year 1922-23. (1) The Farm and Experimental Work especially at Manjri and Baramati was overhauled and is made to bear on the present needs of canal farming. (2) In the Propaganda work there was no change in the policy. Few more lines of work, however, were added; such as Java system of growing cane (in the low lying places which have gone out of cultivation). According to the new scheme of Tagavi under Improvement Loan's Act, the Deputy Director of Agriculture as a Chairman of the Divisional Board is called upon to criticize the applications and inspect or get inspected the schemes for which Tagavi is applied for. This work is greatly increased, especially in Poona and Satara Districts. (3) In the section of Mechanical Engineering, progress is marked, and my Division, as will be seen later, has rendered useful services to the cultivators. (4) In the section of Agricultural Organization, Taluka Development Associations, Irrigators Associations, Sale, Implement and Manure Societies, are included. To aid this kind of work study of markets and land problems is taken up. (5) In the Agricultural Education there is no change in the policy except in the examination of the boys.

Conditions affecting Agriculture of the Division during the year.

3. The year, on the whole, was not satisfactory for South Central Division. The amount of rainfall was deficient, Manjri Farm (Poona District) receiving 13·40 inches (against average of 20), Baramati 8·88 (against 20·84), Kopargaon Farm (Nagar District) 10·87 (against 15·28) and Mohol Farm (Sholapur District) 14·28 (against 25·91 inches). In the Nagar District, which is proverbially

liable to famine, the rainfall though scanty, was received timely and hence the District harvested fair crops. Fodder obtained was hardly enough for the year's supply throughout the Division. For sugarcane the year was very bad, having long breaks in rains, defective humidity, abnormal heat and very wide range of daily variation in temperature. The average outturn of gul per acre was poor and the rate obtained was poorer still. Average outturn of cotton was very poor but the high prices made good the short harvest to some extent.

4. The cost of cultivation including manure and labour did not come down to any extent. This affected sugarcane industry as it requires more capital and labour. Sugarcane borer and mealy bugs were bad on all the canals. The attack of bug was very bad. It affected the tonnage as well as sugar contents. During the latter part of the crushing season the Nira Valley Company had to refuse offers of sugarcane as the percentage succrose in the cane was much affected.

Farms and Experimental Work.

Sugarcane.

5. *Situation of Sugarcane Industry.*—Sugarcane industry especially on the canal, is undergoing a very critical time. Before the World War, more than half the sugar supply of the world was got from beet. During war beet sugar industry was completely dislocated. Partly due to this dislocation and largely due to the increased demand for sugar during war the cultivation of sugarcane received impetus and the area under sugarcane increased in all the sugarcane growing countries. After the cessation of war, beet came again in the field forcefully and thus the supply of sugar has increased at a time when the buying capacity of the people in most countries had gone down. The prices of manures (cake and mineral manures) and farm wages which had gone up during war remained high. As a result of these influences prices are falling since July 1922.

The year under report was bad for the growth of cane in the Deccan, while the prices were very low (Rs. 18 to 25 a palla of 250 lbs.). As a result most business farmers suffered losses. Number of tenant farmers have given notices to the owners of land for reduction of rents and some have run away. The area under sugarcane is falling on the main Deccan Canals (Pravara, Godavari, Nira, Mutha and Krishna). In the year 1912-13, it was 13,660 acres. During war it rose. In the year 1920-21, it rose to 20,680 acres. In the year 1921-22 it was 19,570 acres. Next year it will be still less. (According to the preliminary memorandum of the Director of Agriculture it will be about 10 per cent. less in the year 1924-25.)

The Department of Agriculture is now recommending reduced doses of concentrated manures and is introducing certain economies (detailed on page 51 of the last year's report).

6. *Experimental Work.*—There are three sugarcane farms in South Central Division. The main sugarcane research station of the

Department is at Manjri (on Mutha Canal, near Poona), the sub-stations Baramati and Kopargaon are on Nira and Godavari Canals respectively. Instead of giving the results of each farm separately the findings of the important research will be given by problems tackled.

7. *Manjri Farm.*—This is the first year after the new cropping scheme of the farm is introduced. The old work was gone over. The findings are given in the last year's report. Broadly speaking it may be said that the new scheme is intended to investigate the following points :—

(1) Time and application of topdressing (it is a new experiment).

(2) Quantity of Nitrogen to produce heavy crop.

(3) Economic substitution of Farm Yard Manure.

(4) Rotation crops for sugarcane with a view to diversify canal farming. (This is a new experiment.)

(5) Suitable quantities and intervals of irrigation water (new experiment).

(6) Different methods of cultivation.

(7) Variety study.

(8) Chemical study of cane in the field and chemical control in Gurhal house.

In reading the results of the experiments, it is necessary to remember that some of experiments are only one year old.

(1) *Time of Application of Top-dressings—Manjri.*—Last year's results show that the concentrated manure, which is usually given by the farmers in one or two doses when the cane is about five months old, may better be applied in 3 doses ; one dose at the time of planting, 2nd when the crop is three weeks to eight weeks and the 3rd at the time of earthing up.

(2) *The Quantity of Nitrogen to produce Heavy Tonnage of Cane —Manjri.*—In this experiment a mixture of safflower cake and Ammonium Sulphate containing 75, 150, 225 and 300 lbs. of Nitrogen was applied to three different plots in three doses (one at three weeks, one at eight weeks and one at the time of earthing up). The land was green manured with San. Similar experiment was tried at Baramati for the last three years.

It can be said that outturn of cane or gul increases with the increase of Nitrogen. *The financial position, however, depends on the prices of Gul and manures.*

(3) *Economic substitute of Farm Yard Manure—Baramati.*—(*a*) In this experiment 20,000, 30,000 and 40,000 pounds of dry matter (in San green manure and Farm Yard Manure) as bulky manure was compared. All the three plots were green manured and the different amounts of bulky manure were made up by adding Farm Yard Manure.

The plots yielded respectively 18,888, 19,804 and 21,832 lbs. of dressed cane. *The price of extra outturn, however, does not warrant addition of bulky manure (over 2,000 lbs.).*

(*b*) *Manjri.*—The experiment is intended to find out whether whole or part of the Farm Yard Manure applied to sugarcane can be replaced by oil cakes. One plot received 200 lbs. of N. in F. Y. M., another received 100 lbs. in F. Y. M. and 100 lbs. in cake and the third plot received all the 200 lbs. of Nitrogen in cake.

The plot receiving all its Nitrogen in cake has done best. Next comes the plot receiving Nitrogen in cake and Farm Yard Manure. *It, therefore, seems that where Farm Yard Manure is scarce or costly, oil cake can replace it with advantage.*

(*c*) *Manjri.*—This experiment is designed to find out if addition of oil cake to San green manure will pay. One plot was manured with San green and another was given addition of oil cake to make up 200 lbs. Nitrogen.

The plot receiving an addition of oil cake yielded 1,688 lbs. of more Gul per acre and has left a margin over the extra expenditure on oil cake.

(4) *Rotations for Sugarcane.*—Since the cycle of rotations is not complete the figures cannot be interpreted.

(5) *Irrigation Experiments.—Manjri–(a) Interval Series.*—Total quantity of water given as irrigation in addition to rain water to all the three plots is 75 acre inches. Only the intervals vary. One plot gets waterings every 8th day, another gets every 10th day and the third every 15th day. (Due to the canal difficulties the intervals could not be kept up very rigidly though effort was made to avoid violent changes.)

The following table gives the results :—

Interval.	Weight of cane in lbs.	Extraction P. C.	Weight of Gul in lbs.	Borer attack P. C.
8 days ...	71,978	64	8,624	2·01
10 „ ...	52,107	63·4	6,003	8·9
15 „ ...	57,359	61	6,391	4·27

It may be noted that borer attack was bad in 10 day plot and hence the outturn is lower than 15 day plot. It is worthwhile noting that the extraction of 15 day plot is poorer than the others due perhaps to the less juicy nature of canes in that plot. *The results clearly show that the same total quantity of water if applied at shorter intervals produces more cane and consequently more money.* Even at last year's low prices the outturn of the 8 day plot is worth over Rs. 200 more than that of the other plots.

Baramati.—This corroborates the identical experiments conducted for the last three years at Baramati. The following table shows the average result of the last three years at Baramati :—

Interval.	Weight of cane in lbs.	Cost of cultivation.	Net profit.
		Rs.	Rs.
8 day ...	108,160	770	570
10 „ ...	100,220	767	492
15 „ ...	87,040	755	341

It may also be noted that the Belapur Syndicate which receives water by guage goes over the farm at least every week.

Manjri—(*b*) *Quantity Series.*—In this experiment the interval is common (*i. e.*, 10 days) while the total quantity of irrigation water varies. First plot gets 75 acre inches, second gets 100 acre inches and the third 125 acre inches.

The following table gives the result :—

Quantity of water.	Weight of cane in lbs.	Weight of gul in lbs.
75 acre inches ...	52,107	6,003
100 „ ...	61,630	7,528
125 „ ...	75,272	8,850

It is seen that 100 inches plot gives more outturn than 75 inches plot; also 125 inches plot gives more than 100 inches plot.

Baramati.—The conclusion is borne out by the results of similar experiments conducted for the last three years at Baramati.

At Baramati it was found that if the doses be so arranged to give less water when the crop is young and more as the crop advances in the hot season, cutting down the quantity during the rains, the crop comes better.

(6) *Different Method of Cultivation*—(*a*) *Local versus Standard or Manjri system and the effect of prices of Gul and Manure on the business—Baramati.*—The comparison is instructive and will be given rather in detail. There were three plots (1) Standard method (depending on San green manuring for bulky manure), (2) Standard plot with addition of 20 cart loads of Farm Yard Manure per acre, (3) Local method plot. The first and second received 150 lbs. of Nitrogen in Ammonium Sulphate and cake per acre in two

top-dressings. The third or the local plot received 40 cart loads of Farm Yard Manure before planting and about 220 lbs. of Nitrogen in safflower and castor cakes in two dressings. The first two were planted in rows 5′ apart (the seed rate for the first two was 8,000 sets per acre). In the local plot 14,000 sets were planted in beds in rows $2\frac{1}{2}$′ apart.

The following table gives the results of the experiments from 1921-22 to 1923-24 :—

Years.	1921-22.				1922-23.	
	Weight of Gul per acre.	Cost of cultivation per acre.	Value of outturn per acre.	Profit or loss per acre.	Weight of canes per acre.	Cost of cultivation per acre.
1	2	3	4	5	6	7
	Lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Lbs.	Rs. a. p.
Standard Method (without F. Y. M.).	7,336	737 0 0	1,146 4 0	409 4 0	96,932	847 3 0
Standard Method (with 20 c. c. of F. Y. M.)	8,956	854 7 0	1,399 6 0	544 15 0	101,366	871 7 0
Local Method ...	10,951	1,157 15 0	1,711 1 6	553 2 6	100,930	1,122 13 6

Years.	1922-23.		1923-24.			
	Value of outturn per acre.	Profit or loss per acre.	Weight of canes per acre.	Cost of cultivation per acre.	Value of outturn per acre.	Profit or loss per acre.
1	8	9	10	11	12	13
	Rs. a. p.	Rs. a. p.	Lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Standard Method (without F. Y. M.)	1,343 8 0	496 5 0	85,920	587 2 3	966 9 7	379 7 4
Standard Method (without 20 c. c. of F. Y. M.)	1,405 2 0	533 11 0	105,880	645 2 3	1,164 10 10	519 8 7
Local Method ...	1,399 0 0	276 2 6	109,480	896 13 3	1,205 2 10	308 5 7

It is seen that the outturn of cane and gul and also the costs of cultivation of the local method plot are more than those of the other two plots throughout. The effect of price of gul, however, has made considerable difference in profits in different years. In the year 1921-22 the prices of gul were high, while in the year 1923-24 these were low. The cost of labour had not fallen in proportion. As a result, in the year 1921-22 the local plot left more profit than in 1922-23 and 1923-24. With low prices the moderate doses of standard method left better profits.

It is, therefore, not very safe to give any prescription for manure and other costs. The best way is to induce the farmers to keep accurate accounts and to make them compare these as changes in prices of manure and gul take place.

(*b*) *Distance between the Rows in the Standard System—Manjri.*—One plot was planted 4′ apart and another 5′ apart in rows. The four feet plot has given better results. It is, therefore, worthwhile going into the question more deeply. Trials of distances between the rows were conducted on private farms by the Divisional Superintendent of Agriculture, Deccan Canals, Kopargaon, and his staff in the District. Though these were carried under different conditions here also it seems that in fairly deep black soil four feet is the best distance. The results of one of these on the Nira Canal are given in the subjoined table :—

Distance between rows in feet.	Yield per acre Gul in lbs	Profit or loss.
		Rs.
5 feet ...	11,455	322
4 „ ...	12,268	402
3 „ ...	11,369	300

(*c*) *Kopargaon.*—The standard method (5′) was compared with the West Indies modified method (6½′ and 3½′ alternately). The modified West Indies method gave better results.

(7) *Experiments with Varieties of Sugarcane—Manjri.*—The object is by repeated trials of selected varieties to test their fitness for cultivation, under field conditions. The treatment was common, that is, Standard Method. The varieties so tested were in the first instance grown for some years in small plots.

Serial No.	Name.	Weight of Gul in lbs.	Weight of cane in lbs.	Extraction p. c.	Brix corrected.
1	Red sports ...	8,128	74,851	69·0	16·86°
2	Waxy Red ...	8,153	60,053	70·0	19·14°
3	White transparent ...	8,024	61,762	68·5	19·46°
4	D-109 ...	7,948	71,563	62·2	16·15°
5	B-1528 ...	7,381	59,474	68·3	17·12°
6	Java ...	7,137	63,668	64·1	18·44°
7	Pundia ...	5,585	47,926	71·0	18·50°
8	B-208 ...	5,542	46,745	64·0	18·6°
9	Manjav ...	4,863	41,894	67·0	17·61°

The results show that all the selected varieties except B-208 and Manjav have beaten Pundia. Waxy Red and White Transparent are below D-109, B-1528 and Java in point of the weight of

cane but having higher percentage of total solids rank higher in point of the weight of gul which after all counts more for our farmer.

In the following tables instead of giving the outturns of cane and gul, a different scheme of presenting the results is adopted. Pundia, which is the common variety, is taken as 100, while the varieties compared with Pundia are given their valuation according to their performance. The following tables show the results of four years (1920-21 to 1923-1924):—

Comparison on the basis of four years' average *gul* as criterion.

Name of Variety.	D-109.	Red sports.	B-1528.	Waxy Red.	Manjav.	White Transparents.	Java.	Pundia.	B-208
No. in order of merit.	1	2	3	4	5	6	7	8	9
Gul ...	146·09	143·08	122·85	110·27	102·5	102·05	100·706	100	87·52

Comparison on the basis of four years' average with *cane* as criterion.

Name of Variety.	Red sports.	D-109.	B-1528.	Java.	Waxy red.	Pundia.	White Transparent.	Manjav.	B-208.
No. in order of merit.	1	2	3	4	5	6	7	8	9
Cane ...	153·15	147·93	114·75	113·29	109·97	100	98·91	96·65	89·84

The average results also confirm the conclusions drawn above. D-109, Red sports, B-1528 and Waxy Red are decidedly outstanding. Many other promising varieties are being tried but their results are not mature. These will be soon ready for field trial.

At Kopargan (Godavari Canal) the ratoons of Manjav, Red sports, B-376 were kept along with that of Pundia. All of them beat Pundia; Manjav yielding 97,920; Red sports 97,240 and B-376 76,880 against Pundia yielding only 75,968 lbs. of dressed cane. At Kopargaon as plant cane Red sports in 1922-23 yielded better than Manjav. It is interesting to note that Manjav does better on Godavari Canal. It has done very well on most of the private farms there, and it is gaining popularity. It does not tiller much but does better when planted comparatively thick and for filling gaps. At Manjri (on the Mutha Canal) it was badly affected by mealy bugs and did poorly. It was tried on a fairly large scale by a farmer at Loni but it was not as good as Pundia.

8. *Java Method of planting Cane.*—Upon seeing the rain fall and soil conditions in the sugarcane tract of Java in the year 1922, I thought that the trench system, of preparing the land and planting cane, would suit most of the water logged lands, on the Nira and Godavari Canals, which have gone out of cultivation and would

enable the owners to raise good crops of cane with very few waterings. With some difficulty, I got the Executive Engineer, Poona Irrigation District, to grant Mr. Unde of Hol (on Nira Canal) half an acre additional area with a view to give trial to this method. Part of the expenses were borne by the Agricultural Department. The land was waste due to water logging.

The system is intended to supply water when required and to drain the excess water in the soil as well as the surface wash of the rain. Small drains 1½′ wide at the top, 1′ at the bottom and 2½′ deep are opened every 34 feet across the fall of the land. According to the nature and lie of the land and at right angles to the small drains, trackers (bigger drains) 2½′ wide at the top, 1′ at the bottom and 2¾′ deep are opened about 120′ to 200′ apart. These trackers are joined to a main drain or drains which take the excess water away. In the middle of the rectangles made by the trackers and small drains, raised foot paths are kept.

The trenches or furrows 21″ wide and 12″ deep are opened about 4′ apart parallel to the trackers for planting sugarcane sets. While opening these trackers, care is taken to leave 9″ dams along the small drains. All the work is done by hand. The soil from the trenches for furrows is piled between the furrows to form ridges and the bottoms of the furrows are lightly dug and cane sets planted at the rate of the 5,000 sets per acre. The cane plants in the furrows receive soil from the ridges in three instalments. In Java about 80 lbs. of Nitrogen (in Ammonium Sulphate) is given when the plants are very young. At Hol we, however, gave the usual quantities of manure but rather early.

At the time of watering, the drains were filled and water bucketted from these to the furrows. Only five such waterings were given. The plot produced 8,030 lbs. of gul and 13,000 sets for planting. Neighbouring plot, which was not spoiled and which was under cultivation, produced only 7,500 lbs. of gul.

The crop was as good as any in the tract and attracted the attention of many cultivators. A neighbour of Mr. Unde has put in four acres of his water logged waste under this system. The stand of the crop is very good.

9. *Complete Manure of the Union Agency.*—It analises 5·50 per cent. Nitrogen, 2·69 Amonical Nitrogen and 1·25 per cent. Phosphoric Acid. It was tried on the canals and also on the river Warna on lift irrigation. The manure was given on the basis of equal cost and was compared with the usual top-dressings of Ammonium Sulphate and oil cakes. In one case it has given better result; in others it has given either equal to or a bit less outturn than the other plot. The trial is continued under closer supervision.

10. *Turmeric as alternative or rotation Crop.*—With the fall of prices of gul and increase of price of Turmeric, efforts were made to introduce this crop on the canals. Seed was distributed at concession rates. The high prices realised for the outturn has given a

very good impetus to this crop. It is not safe to depend upon one money crop like sugarcane and the introduction of Turmeric, it is hoped, will help to diversify canal farming to some extent.

11. *Fodder Supply.*—The fodder section of the Farm at Kopargaon grew fodder as usual. The season being very poor the outturn was low. The total outturn of the fodder section was 193,608 lbs. dry and 155,754 lbs. green. At the same time of the report (August when fodder was very scarce) this section is rendering very useful service. It is supplying baled kirbi to several hundred cultivators from all over the eastern talukas of the Deccan.

District and Propaganda Work.

12. Tne organization of the Propaganda work is continued on the last year's lines. The District Staff held number of demonstrations, helped the cultivators by way of giving advice and rendering practical assistance in treating seeds and crops against pests, supplying seeds and manures, assisting in repairs of machinery, boring wells, helping in the marketing of the crops, &c. The staff also helped the several Taluka Development Associations.

13. The Divisional Board met regularly and invinced interest in their work. There was no change in its personnel.

The work of the Board was regularly reported to the Director of Agriculture and the Registrar of Co-operative Societies. The Board looked after the work and finances of the Taluka Development Associations and the distribution of loans for land improvement. It assisted the Registrar, Co-operative Societies, by way of criticizing and making recommendations on the applications for the formation of Co-operative and Manure Societies, &c.

The Board lays down policy for giving loans under Land Improvement Loan's Act. During the year under report 36 applications from several co-operative credit societies for over Rs. 1,00,000 were recommended. The inspection of schemes has greatly added to the work of the Deputy Director of Agriculture and his staff.

14. *Demonstration, &c.*—During the year over 45 demonstrations were held in the several districts noted below. All these were well attended. Besides these demonstrations, parties of cultivators were taken to Hol (Nira Canal) to show them how the low lying water logged lands can be made to grow sugarcane by Java Method and also to Mohol Farm (Sholapur District) for showing how fairly good crops can be grown on every moderate rainfall by means of proper cultivation or dry famine methods:—

Canal tract	...	10
Satara District	...	4
Poona District	...	16
Sholapur District	...	7
Ahmednagar District	...	8

15. *Improved Furnaces.*—A trained fieldman was deputed to Warna Valley (Satara District) for constructing and demonstrating the Poona furnace. Several new furnaces were constructed and their working demonstrated. The people were satisfied at the performance of the furnaces. A multiple furnace was built for the Irrigation Association at Kolhar (Pravara Canal) and worked for several weeks. The furnace has become a necessary adjunct of power crusher and the use of such combination is spreading.

16. *Crop Pests and Diseases.*—Campaign against Tambera Disease (Mites) on potatoes in Khed Taluka was continued as in the past year. The work was organised through the Taluka Agricultural Development Association, Khed. In all 125 cutivators from about 20 villages took the advantage of spraying and dusting their crops. In all about 95 acres were treated. Fumigation against potato moth, was undertaken for the cultivators in the Khed Taluka and a goodly number of cultivators took advantage of this facility. Over 62 tons of potatoes were fumigated.

17. Under the special orders of the Government, steeping of jowari seed (against smut) was undertaken on extensive scale with the help of Revenue Officers. About 16,338 packets sufficient for about 65,352 acres were distributed and several dozen small demonstrations of steeping were given.

18. *Pig Killing.*—Pig killing by poison baits was tried again and again but was not found successful. A short campaign of pig killing was organised for the Irrrigators Association, Godawari Canals. The operations were confined to distributories 7 and 8 on the Left Bank Canal. The Department gave a subsidy of Rs. 200 and also lent 4 guns. The Association contributed Rs. 180-3-0. As a result of the campaign, 29 pigs were killed and 13 wounded.

19. *Implement Depots.*—The most noticeable feature of the year was that Messrs. Kirlosker Brothers brought down the prices of iron ploughs by nearly 50 per cent. owing to the keen competition of a rival firm started at Satara Road Station. It may be remembered that apart from the two Implement factories (Kirloskar Brothers and Satara Industrial Works) there are a very large number of business people throughout the Division who keep large stock of iron ploughs for sale and hire. As a result the demand on our Depot is going down. In fact, the Departmental Depots have done their work and it is nearing time that they should cease. All the same the Departmental Depots earned Rs. 2,302 as hire.

20. *Distribution of Seeds; Implements, &c.*—As a result of sustained efforts of the Department, by way of demonstrating the use of implements and concentrated manures and maintaining implements and manure depots to supply these a number of private shops all over the Division have been opened who supply implements, accessories and concentrated manures. Besides, the Cooperative Manure, Implement and Sale Societies have sprung up. All these render very useful service to the farmers of the Division.

The following table shows the distribution of seeds, manures, implements and copper sulphate packets done through the District Staff. In some of these cases the orders received were sent for compliance to the firms direct :—

Name of District.	Seeds.		Implements.		Manures.		C. S. packets.	Remarks.
	lbs.	Value.	No.	Value.	Quantity	Value.	Number of packets.	
		Rs.	lbs.	Rs.	lbs.	Rs.		
Sholapur ...	9,982	963	31	975	16,400	2,386	2,360	
Satara ...	801	81	7	820	...	...	1,602	
Ahmednagar ...	36,470	4,558	346	10,373	1,120	130	8,060	
Poona ...	855	162	6	415	9,940	779	2,137	
Canal tract ...	9,840	1,526	186	4,701	57,865	7,298	2,179	
Total ...	57,948	7,290	576	17,284	85,325	10,593	16,338	

Agricultural Engineering.

21. *Boring.*—During the year under report one power plant was added to the stock of this Division making in all two Engine and four hand power plants. One of the hand power plants is lent to the Taluka Development Association, Madha. The details of the working of each of the machines is tabulated below :—

Machine No.	Idle for want of		Working days.	Average work done per day.	Number of bores in the year.		No. of feet bored.	Amount of bills for bores.	Remarks.
	Coolies and Holidays.	Repairs, accident, transit, enquiries.			Successful.	Unsuccessful.			
								Rs. a. p.	
17 Sholapur, H.	49	127	190	3′ 2″	10	1	596′ 0″	769 8 0	
28 Sholapur, H.	42	69	255	4′ 6″	19	1	1,146′ 0″	1,602 9 0	
8 Satara, E. ...	35	207	124	4′ 8″	3	4	605′ 6″	1,104 13 0	
25 Satara and Poona, H.	52	120	194	2′ 10″	6	4	552′ 0″ 133′ 0″	699 9 0	The work of bore of 133′ is in progress and not billed for.
18 Poona, E. ...	29	55	129	3′ 9″	4	1	479′ 0″	707 4 0	The machine was transferred to this Division in December.
Total ...	...	...	892	...	42	11	3,511′ 6″	4,973 11 0	
	Average work per machine in the year... 766′								The average is calculated on the working of 4 machines for full one year and of the 5th machine for 7 months only.
13 Poona and Madha, H.	27½	248½	90	5′ 4″	8	...	5′ 10″ 481′ 6″	57 8 0 395 0 0	This machine is lent to Madha Association after the work at Poona was finished.

H=Hand-power. E=Engine-power.

Though analysis of the bores taken is not made, it seems that water is generally tapped within 60 to 80 feet from the ground level in the Deccan. Of the deep bores (between 100 and 200 feet deep) in Satara and Poona Districts only one (at Satara Road Station) is successful. Most of the shallow bores in the Sholapur City tapped good supply of water.

It is rather a hard job to keep the plants busy and save wastage of time in shifting and transport. Every effort, however, was made to keep the plants busy. The Assistant Boring Overseer attached to this Division was on sick leave and all the work had to be managed by me and my office with whatever help I got from the Boring Assistant of the Agricultural Engineer.

In passing I may note that the boring charges are too heavy for the small Deccan farmer and as a result I had to accept several indents for non-agricultural purposes. *If unsuccessful bores (made for Agriculture) are not charged for the cultivators will be encouraged to invest money in boring and thus improve their farms.*

22. *Power Crushing.*—A second Power Plant No. 92, Chattanuga, was added to this Division during the year under report. This plant was let out to Kolhar Irrigator's Society on Pravara Canal. The old Plant No. 44, Chattanuga, was let out to two farmers on Mutha Canal. As a result of personal experience one of them purchased a new crusher for himself through the Deputy Director. The Division has by now over 16 private power crushers. The Mechanical Assistant rendered considerable help and gave advice to the owners of most of these.

The following table gives the performance of the two power plants maintained by the Department for demonstration and service:—

No. of plant.	Average extraction.	Number of working days.	Pans boiled.	Hire earned.	Remarks.
				Rs. a. p.	
Chattanuga No. 44 ...	69·75	116	803	506 9 0	Both are rather old plants.
Chattanuga No. 92 ...	66·46	99	1,275	682 8 0	

As a result of the experience with power crusher at the Government Farms and in the District, it is found that though the substantial cane farmer needs power crusher and finds it useful, the type (*e.g.*, Chattanuga) which is used for demonstration is not satisfactory. The British makes which the Government Farms at Manjri and Kopargaon use are found satisfactory, but unfortunately, British manufacturer does not manufacture smaller plants. Negotiations are, therefore, opened with Dapuri Work-shops and Messrs. Kirloskar Brothers.

23. A suitable ridger for opening furrows for planting sugarcane and earthing it up is built with the help of Messrs. Kirloskar Brothers which is found useful.

24. A rope making machine which was seen by me in Japan is ordered. It is just received. It is expected that it will be found very useful and will make a suitable side industry to the Konkan and Mawal peasants.

Agricultural Organisation.

25. *Taluka Development Associations.*—Of the three Taluka Development Associations formed in 1922-23, the Khed and the Madha Taluka Associations continued their activities successfully.

(1) The Khed Association has engaged a trained fieldman. The Association sprayed about 95 acres of Potatoes against Tambera, fumigated over 62 tons of Potato tubers and gave several demonstrations. The Association has formed a Potato Sale Society and struggled hard against the combination of brokers.

(2) The Madha Taluka Association was allowed to retain the Departmental Fieldman. The Association has purchased a few iron ploughs, a chaffcutter and a spray pump for demonstration. It distributed 5,806 lbs. of N. R. Cotton Seed to 146 cultivators, 210 lbs. of Akola Bajri Seed to 50 cultivators, and a large variety of vegetable seeds to large number of people in the taluka. The Fieldman demonstrated iron ploughs and wooden drills (for sowing wide). As a result of these demonstrations over 44 ploughs were ordered by the cultivators through the Association. Side by side it supplied a large number of accessories including 26 shares of iron ploughs. It also distributed free of cost about 26 wooden drills meant for sowing seed wider than the local practice. The Association has popularised manila rope for Mhot and supplied over 2,725 feet rope. It demonstrated steeping of jowar against smut and distributed 750 packets sufficient for 3,000 acres. With the help of boring plant lent by the Agricultural Department, the Association took eight bores.

(3) The Satara Taluka Development Association had engaged a Fieldman but he left the service. The Association has not been able to fill his place. The Association gave few demonstrations and distributed freshly imported Spanish peanuts.

(4) A new Taluka Development Association is formed at Islampur (Taluka Walwa) during the year under report. It has engaged a trained Fieldman. It is expected that this Association will be very useful to the Agriculturists of the taluka.

26. *Irrigators Association.*—The Irrigators Association at Kopargaon (for Godavari Canal) and Baramati (for Nira Canal) are doing useful work. During the year under report I was able, with the help of Messrs. Kalbhor of Poona and Bala Patil of Narsingpur, to form two more Associations, one at Poona (for Mutha Canal) and one at Shenoli (for Krishna Canal) in pursuance of the recent orders

of Government. Besides these the irrigators on Ekruk Tank (near Sholapur) have formed one. Though at present these Associations concentrate on ventilating their grievances they are found useful in introducing improvements in Agriculture. Efforts are made to interest them in non-credit co-operation.

The Kolhar Society has undertaken to manage a distributory supplying water for 100 acres cane and 600 acres other crops. In addition, it hired a Departmental power crushing plant and milled over 70 acres of cane on joint responsibility. The Department found this society useful in introducing proved improvements in sugarcane growing, especially because the tract is newly opened for sugarcane and the local cultivator knows very little of cane farming.

27. *Non-Credit Co-operative Societies.*—This work is only recently entrusted to the Deputy Director of Agriculture. It may be said that though Co-operative Credit Societies have succeeded in South Central Division, the Non-Credit Societies have not. There were over 32 Non-Credit Societies in 1922-23 though hardly more than half a dozen of them can be said to be working. Probably the precarious and uncertain rainfall, smallness of holding and illiteracy of the farmer are largely responsible. Perhaps these societies were formed in haste without giving special attention to the needs and the economic condition of the people. It was, therefore, proposed to proceed cautiously. It seems that the canals offer better facilities for Gul Sale and Manure Societies; while the light soil tracts (requiring shallow ploughing more often) of Nagar offer opportunities for well organized Implement (Plough) Societies.

This in view, attempt was made to start a Gul Sale Society at Poona, revive Manure Society of Manjri and start two large Implement Societies in the eastern part of Nagar and it can be said that this short programme is carried out to some extent:—

(*a*) *Gul Sale Societies.*—(1) Of all kinds of Non-Credit Co-operative Societies marketing (of Gul) in the canal tracts seems to hold great promise. Rao Saheb Kale of Hadapsar was thinking of a Gul sale shop for sometime. At the same time Mr. Ghule, a broker at Poona, who has had long experience in the line and who is actuated by class consciousness was prepared to work in the interest of farmers. It was, therefore, thought possible to combine the influence of the veteran co-operator Rao Saheb Kale and experience of Mr. Ghule. The idea was mooted in 1922-23. After several small conferences with the Director of Agriculture and Registrar, Co-operative Societies, it was decided to form a society at Poona to serve the sugarcane cultivators of the Haveli Taluka. Some difficulties arose but these were overcome by Mr. Madan, the Registrar, very tactfully and the society was registered. It is gratifying to note that in the very first year, the society was able to sell over 1,250 carts of Gul.

(2) Mr. Rajadnaya of Aitawade (Satara District) has organized a sale shop through the Yellur Union at Kolhapur.

Though it is not a sale society, it is expected to render useful service to the sugarcane growers in Warna Valley.

(*b*) *Potato Sale Society.*—A sale society is organised by the Potato growers in Khed Taluka under the guidance of Dr. Mann who is long associated with the Khed people. The volume of the business is not very large and only very few brokers in Poona handled most of the crop. It is, therefore, easy for the brokers to combine. The commodity is perishable; while the cultivators (members) lack in co-operative spirit. As a result the society could not start its work. The efforts of the officers of the Agricultural Department and of the few loyal members are not wasted and it was possible to induce the Poona Municipality to introduce iron scale in place of the old fashioned wooden balances. The potato growers were agitating for scales for years.

(*c*) *Implement Societies.*—There were ten societies at the beginning of the year. Two more registered during the year and third (at Shevgaon) has applied for registration. It is the last one to which the District Agricultural Overseer, Ahmednagar, was asked to pay special attention, since its development was intended to be different in size. The small societies have not much furnished and so a large society for a taluka with a paid man to look after the work, was organized. The capital of the society is Rs. 10,000; out of which about Rs. 4,750 are collected. It has got 110 iron ploughs. It worked for two years without being registered and earned Rs. 3,428 as hire (in two years) from over 500 cultivators. Similar society is contemplated for Pathardi Mahal.

Agricultural Education.

28. *Marathi Agricultural School, Loni.*—Thirty boys were admitted in the first year. Many of them, however, were either unsuitable or too poor to follow the instructions. Only 18 were finally retained. Out of them 17 passed. In the second year, there were 22 students in the beginning of the year. One of them left the school. 21 appeared for examination out of whom 19 passed.

The following shows the castes for their parents:—

	1st year	2nd year.	
Marathas, Kunbis, &c. ...	12	9	
Brahmins ...	6	10	
Others ...	0	2	
Total ...	18	21	= 39

Out of the total number of 39 students 19 were from South Central Division, 16 from other Districts of the Bombay Presidency, 1 from Berars and 3 from States.

29. As in the last year, the school, in addition to its legitimate work, trained 5 teachers deputed by the Educational Department for the Agricultural bias schools. By now there are four bias schools in South Central Division. Some of the teachers trained at Loni are appointed to the bias schools in North Central Division and Southern Division. The scheme shows every promise of success. The school at Peit (Satara District) is receiving special attention of Mr. K. S. Dikshit, B.A., the Deputy Educational Inspector.

30. During the year under report a change was introduced in the examination. In addition to the Terminal and Annual Examinations regular weekly examinations were held. The weeklies were given certain valuation in the final result. This kept the boys up to mark and one or two failed in the annual test were pulled up as they deserved, on the strength of their work throughout the year.

Since the accounts are not audited yet, the statement of finances cannot be given. However, it can be said the cost of boarding and the total cost of educating a boy is brought down.

Personal.

31. The staff in the Districts and in my office worked satisfactorily. The work of Mr. V. V. Gadgil, District Agricultural Overseer, Ahmednagar, deserves special mention. He ably organized the Shevgaon Implement Society. Perhaps it is the biggest Implement Society in the Presidency run very successfully.

Poona:
4th September 1924.

P. C. PATIL,
Deputy Director of Agriculture,
S. C. D

APPENDIX E.

ADMINISTRATION REPORT AND SUMMARY OF WORK DONE BY THE DEPUTY DIRECTOR OF AGRICULTURE, SOUTHERN DIVISION, FOR THE YEAR 1923-24.

Staff and Organisation.

Mr. Gilbert, after his return from leave was transferred to Sind. I held charge of the office of the Deputy Director of Agriculture, S. D., throughout the year, and was out on tour for 254 days.

Gadag farm was abolished and a new Rice Breeding station was opened at Mugad, 6 miles from Dharwar.

The District work was altogether re-organised with the approval of the Director of Agriculture and the Registrar, Co-operative Societies, B. P., Poona. The Inspectors and Overseers were doing mainly propaganda work and the Agricultural Organisers were attending to organisation work in the same area. This largely meant overlapping of work with all its evils and considerable waste of time and money in travelling. Under the new organisation, all these officers are given separate charges (three talukas each) wherein they are required to do both propaganda and organisation work. This arrangement aims at concentration in different limited areas with efficiency and economy. The Deputy Director has now ten District Officers (six graduates and four non-graduates) directly responsible to him, working in different quarters of the Division, divided mainly on the basis of the nature of different tracts and the problems to work with. Besides this regular District staff arranged on territorial basis, he has under him a Cotton staff, a Boring staff, a Mechanical Assistant, an Embankment Officer and a Seed Organiser doing special works in the Division and he has four farms and a Breeding section to attend to. He is now required to work direct with 20 heads of sections in different lines and his work has considerably increased. The Deputy Director continued to be the Chairman of the Divisional Board and guided the operations of seven Taluka Development Associations and 67 Non-Credit Societies through his District staff.

2. There were many changes in the personnel of the staff which affected the work to a certain extent. Messrs. R. K. Kulkarni and S. G. Kadkol were lent to the Indian Cotton Committee. Messrs. T. S. Swadi and H. B. Kulkarni were on leave for 8 months and Mr. G. R. Deshpande for one year and seven months. Mr. M. A. Shetti, the Seed Organiser, was deputed to act as Assistant Registrar for a year and Mr. R. S. Patil, one of the Agricultural Organisers, took his place. Mr. R. K. Itigi, the District Agricultural Overseer, Haveri, was made the Agricultural Organiser and a new graduate has been appointed in his place. In all five new graduates had to be entertained during the year and trained to do their duties.

Season.

3. The special features of the season were—scanty rainfall in June, abnormally heavy and continuous showers in July, and absence of rains in October and November which affected the growth of almost all crops except cotton.

4. In Mallad (Western Talukas) owing to want of rains in June and heavy rains in July, paddy crop could not be sown in time and many fields had to be left fallow. The crop sown suffered from floods when young and from long break in October at the time of grain formation. The paddy crop is estimated to be 60 per cent. of the normal.

5. In Gadinad (Transition tract) jowar suffered from the same causes and the crop remained stunted. It is estimated to be half the normal. Cotton crop thrived very well uptil October when continuous break acted as a check. Easterly winds, however, did not prevail and bolls formed did not drop. Westerly winds kept up the moisture and saved the crop. The yields were better than expected and approximated to average. The season for sowing cotton was very favourable and the area considerably increased during the year. Owing to absence of late rains, the crop matured earlier than usual, and one of the marked effects of this early ripening was a fall in the ginning percentage.

6. In Yerinad (Eastern tract) the rainfall was very scanty. Both rabi jowar and wheat crops almost failed and gave very poor yields. Cotton did fairly well and so did Safflower. Upland cotton round Gadag and Ron and in bunded fields of Bijapur District has done considerably well. In a few places favoured by late rains, the cotton crop was a bumper one this year. It is the cotton crop which saved the situation of this tract.

7. The Mallad cultivator has not obtained enough for himself and his cattle. He has supplemented his fodder supply with forest grass. The condition of cattle conidserably fell during the hot weather, and many died from epidemic diseases. The Gadinad cultivator has got enough. The high prices of cotto nhave enriched him. The Yerinad cultivator obtained very little to eat but the cotton crop saved him.

8. Scarcity of fodder supply and drinking water were greatly felt. On the whole the season under report was far from satisfactory in most parts of my Division and its effects would have been worse if the prices of cotton realised were not so high. The prices of food stuffs went high only for a period, but import of rice from Bezawada and jowar from Davangeri side soon reduced them to normal.

9. The work done by various sections will be summarised under the following heads:—(1) Investigation and Experiments, (2) Propaganda, (3) Organisation, (4) Agricultural Education and (5) Miscellaneous.

Investigation and Experiments.

10. Investigation was mainly done on Government farms, Dharwar, Gokak, Tegur and Mugad, whereas experiments were conducted on Government farms as well as in culivators' fields.

11. *Dharwar Farm.*—This farm continued to rise in importance as a Plant Breeding station. In cotton, selection in the cross between Dharwar No. 1 and Rosea and the study of the cross between Dharwar No. 1 and Wagale were the main items of work.

The cross between Dharwar No. 1 and Rosea reached its 6th generation during the year. There were many pure lines which were uniform for good yielding character. Further selection was made in these promising lines and about 100 plants individually taken. These represnt only three plants of F2 generation, the majority of them being derived from only one plant of that generation. Some of these selections are very promising and their behaviour on a large scale is being watched.

12. Thirty-one strains of the cross that were foundto be pure for high ginning and long staple were tested for yield during the year. The yield varied from 225 lbs. to 550 lbs. per acre. Of these 13 have been selected for further trial. The strain 1-A-18-3-15 has given the highest yield (550 lbs. per acre) with ginning percentage 33 and staple 1·1″. It is proposed to multiply the seed during the coming season and a small quantity of selfed seed is obtained for the purpose.

13. I am very glad to state that the Cotton Breeder, Mr. Kottur, has succeeded in obtaining strains which have all the desired characters of the two parents and we have great future for this cross.

14. The cross between Dharwar No. 1 × Wagale reached its F2 generation. The F1 generation does suffer from wilt. The wilt resistant character is not completely dominant. The F2 generation is more resistant to wilt than F1 and may give resistant plants of the Wagale type. Selection of wilt resistant plants with other desirable characters is made in the F2 generation and these will be grown during the coming season for testing the inheritance and for further selection. The study of the Special Cotton Mycologist indicates that Wagale is immune to cotton wilt or at any rate immune to the species of cotton wilt that is prevalent on the Dharwar farm. This enhances its value in breeding wilt resistant strains.

15. Selfing and multiplication of the seed of Dharwar No. 1 and Gadag No. 1 cottons continued as usual.

16. Jowar Breeding work comprised (1) maintaining some important varieties pure, (2) selection for high yield among the local varieties, and (3) study of characters. The varieties that were kept pure by protecting the ears from cross fertilization were Chowri (two types), Arlin, Nandyal, Muddinandyal, Mahisal, Holgi,

Vagar (two varieties), Fulgar white, Fulgar yellow and Handimasadi. Of the two types of Chowri, the amber glumed type is giving better yields than yellow glumed, and further work will be done only on that type. Nandyal and Muddinandyal types fared better than Fulgar types during the year. Holgi did not give good ratoon (second crop) for want of late rains. Vagar variety has two types. One with dark red grains gives better yield than that with yellowish red grain. These will be tested in the Mallad area during the coming season.

17. Selection for yield continued in Fulgar yellow, Fulgar white, Nandyal, Muddinandyal and Mahisal varieties.

18. A few strains in Fulgar yellow, Fulgar white and Nandyal were grown on large scale for testing their yielding capacity and they are promising.

19. The following characters are being studied with a view to discover the correlation if any of any of these characters with yield :—

(1) Stem—(*a*) height, (*b*) number of nodes.

(2) Leaves—(*a*) size, (*b*) colour of mid rib.

(3) Pedancle—(*a*) length, straight or curved condition.

(4) Ear—(*a*) length of rachis, (*b*) breadth of the ear, (*c*) weight.

(5) Grain—(*a*) percentage of grain to ear, (*b*) colour, (*c*) size, (*d*) weight.

(6) Earliness—On all the above characters.

The data so far collected will be examined and conclusions drawn.

20. *Natural Crossing.*—An attempt is being made to find out the percentage of natural crossing taking place in jowar under the ordinary field conditions and results will be available next year.

21. Other experiments conducted by the Superintendent of Dharwar were mainly on crops, and manures.

22. *Crop Experiments.*—Comparison between Dharwar No. 1 and Kumpta made by the Superintendent was in favour of the latter, whereas that made by the Cotton Breeder was in favour of the former. The extent of the attack of wilt to Dharwar No. 1 has been the main cause for the difference. The Superintendent, Mr. Shevade, further summerises the results of this experiment for the last five years and the figures are on the whole in favour of the Kumpta Cotton. Wilt is the disturbing factor in the experiment, and Dharwar No. 1 Cotton which is greatly susceptible to this disease will not be introduced in the wilt affected areas. Experiments in cultivators' fields free from wilt are all in favour of Dharwar No. 1 Cotton, except one at Haveri.

23. Dharwar No. 2 Cotton was tried in a wilt-affected plot where Dharwar No. 1 could not grow, and the yields are very encouraging ranging from 435 lbs. to 670 lbs. per acre.

24. Holgi jowar which ratooned well during the last season failed to do so this year due to want of late rains.

25. The Plant Breeding Expert, Poona, sent six strains of Pivala Kathya variety of wheat selected by him for high yield and tillering capacity. These were grown in comparison with local variety (hard red). Results are very attractive and are tabulated below:—

Plot Nos.	Strain No. or variety.	Per acre.				
		Yield of grain.	Yield of chaff.	Value of produce.	Cost of cultivation.	Net profit.
		Lbs.	Lbs.	Rs.	Rs.	Rs.
329	No. 162 ...	742	1,606	124	21	103
342	„ 103 ...	749	955	105	21	84
	„ 167 ...	661	1,284	106	21	85
	„ 168 ...	679	948	97	21	76
	„ 171 ...	665	777	91	21	70
	„ 224 ...	647	822	90	21	69
	Local ...	374	560	55	21	34

The comparative trial will be repeated during the next season with the two best strains Nos. 102 and 103. Observations indicate that these strains flowered a week to fortnight later than local wheat.

26. The Director of Agriculture, B. P., supplied new seed of Spanish Peanut variety of groundnut for trial and multiplication. The crop thrived well for a time but suffered later owing to want of rains in September, and yielded 1,433 lbs. of dry nuts per acre, which fetched Rs. 208 leaving a net profit of Rs. 136 per acre. Two types of plants were found in the crop, one with large plants with large leaves branching and bearing well while the other with small plants with small leaves branching and bearing less. These two types have been separated by the Cotton Breeder, Mr. Kottur.

27. Lucern during the 2nd year of its growth without irrigation gave 16,958 lbs. against 18,336 lbs. last year (*see* page 65, para. 13 of last year's report), a very good yield indeed. The cost of raising it was only Rs. 64 against Rs. 105 of last year. The value of green fodder was also greater during the year owing to scarcity of fodder and the net profit estimated is Rs. 162 against Rs. 139 of last year. The crop suffered from want of late rains.

28. Algaroba plants are making good progress.

29. *Manurial Experiments.*—The experiment on Farm Yard Manure series reached its 16th year during the year under report. An analysis of the results of 12 years was published in 1921-22. In the year 1921-22 a dressing of 15 tons per acre every second year to jowar crop was added to the experiment. Average figures of these four years are tabulated below :—

Manurial treatment per acre.	Average per acre.			
	Jowar.		Cotton.	Net profit.
	Grain.	Kadabi.	Seed cotton.	Per rotation.
	Lbs.	Lbs.	Lbs.	Rs.
15 tons every 2nd year ...	1,379	3,606	476	61
10 „ do. ...	1,270	3,803	436	71
5 „ do. ...	1,085	2,844	399	60
2½ tons every year ...	1,053	2,867	412	62
2½ tons every 2nd year ...	821	2,062	369	49
No manure ...	622	1,831	298	39

The application of 15 tons produced slightly higher yield of both jowar and cotton than 10 tons, but it was insufficient to cover the cost of extra manure. 10 tons every second year to jowar crop is the best application.

30. The heavy dressing of crude night soil in 1914-15 has continued to give good results both on jowar and cotton.

The average results of 4 years of ploughing in Farm Yard Manure either before jowar or before cotton have not paid more than ordinary method of applying it to jowar crop.

31. *Gokak Farm.*—The Superintendent of this farm continued to work mainly with a view to make the farm pay and conducted many useful experiments as well.

32. *Manurial Experiments.*—Top-dressing cane in 3 doses was not in any way better than once at the time of earthing up. The experiment needs repetition. Top-dressing paddy with cake manure has confirmed the results of previous years and no more experiment is needed. The crop top-dressed will only be demonstrated. Results of top-dressing maize, turmeric and chilly crops are not encouraging and the experiments will be repeated. Green manuring with San in the Rabi season has again given better results than Sunflower. Application of 7½ tons of Pig manure per acre has given better results than the same quantity of Farm Yard Manure on maize crop. Pig manure is a new source of manure, available in cities and deserves attention. It has done equally well on fodder jowar. On sugarcane the results are not encouraging and the experiment will be repeated.

33. *Cultural Experiments.*—The modified Manjri Method of cane cultivation was found to be more paying than local and slow furrow irrigation has given better results than local system.

A mixed crop of maize and tur in rows has given decidedly better results than two crops of maize during the same year, and deserves introduction in the tract. Besides immediate benefits the mixture is in the interest of the fertility of the land.

34. *Crop Experiments.*—In the trial of cane varieties Barbedos has given the best results. Next stand the local and Red Mauritius. Dharwar No. 1 and Dharwar No. 5 cottons were compared and Dharwar No. 1 was found to be far superior to Dharwar No. 5 both in point of yield and quality of cotton. A record yield of 1,635 lbs. per acre has been obtained. This variety will be recommended in the Canal tract. In the trial of tobacco varieties, local broad leaved has stood best. Sumatra and local long leaved have given almost equal yields. In the trial of chilly varieties, Byadgi Long has been the best. In the trial of sweet potatoes Ceylon White has given the highest yield of tubers, whereas local red has given the best yield of creepers.

35. *Garden.*—A new plantation of 150 Santras and Mosumbees has been laid out. The nursery is being developed. The garden with all its new plantation worked at a profit. The Santras and pomegranates bore fairly well. Slow irrigation referred to in the last year's report seems to be suited only to guava and pomegranate trees. Taste for fruit trees is developing in the canal tract.

36. Besides field experiments, the farm sold implements, manure, and seed worth Rs. 5,660 to the cultivators from its depot, trained candidates including the Devi-hosur Agricultural School students in gul-making and cane and fruit cultivation, answered querries received from cultivators and arranged to crush cane of the neighbouring cultivators with power crusher.

37. *Tegur Farm.*—The year under report was a very trying one in general for cattle which suffered from scarcity of fodder and drinking water as well as epidemic diseases. Tegur Farm was kept free from contagion. A good quantity of fodder was grown in the Kharif season and sufficient hay was prepared out of spear grass. The grass did not grow well in September and could not be harvested for silo-making. Only one pit was filled in, which contained 20,000 lbs. The supply of drinking water in the well was adequate. The cattle on Tegur Farm, therefore, continued to thrive well. The herd is gradually improving and is attracting the attention of surrounding cultivators. The cross-bred bullocks have fetched far better prices than country ones of the tract which is the real test of the improvements effected. The farm is run by a practical fieldman, Mr. Gulayya.

38. *Mugad Farm.*—Mr. Bhalerao who has done rice breeding work on Karjat Farm is in charge of this new station.

39. Rice breeding work on this farm was conducted on two common varities, *viz.*, Mugad and Antarsal. 118 samples of Mugad and 93 of Antarsal were collected from intelligent cultivators in 40 places in the Mallad talukas of Dharwar and Belgaum Districts through the District Agricultural Overseers and grown in two lots (dibbled and transplanted). The individual plants numbered 24,000 in Mugad and 14,000 in Antarsal variety. Out of these, 321 plants in Mugad and 266 in Antarsal have been selected. Many of these are selected on the basis of characters supposed to be associated with high yield, while a few of the selections are purely of botanical interest. Various characters of these individual plants and their numerical values have been recorded.

40. The main characters of economic value on which selection is based are (1) flowering date, (2) plant height, (3) tillering capacity, (4) panicle length, (5) grain weight of plant, (6) straw weight of plant and (7) number of grains per ear.

41. These individual selections have been preserved separately for next year's sowing together with a sample of mixed lot for comparison.

42. Along with rice breeding the problem of Gonag* is being studied further. Various samples have been collected and preserved for study during the coming year.

43. *Experiments in Cultivators' Fields.*—The District staff conducted a number of experiments the important among which were :—

(1) *Bone meal on paddy crop.*—The use of this manure is steadily increasing in Khanapur Taluka of the Belgaum District.

(2) Top-dressing cake manure to paddy crop. The use of this manure is also gradually extending.

(3) *Cake and ammonium sulphate to Sugarcane Crop.*—The use of these manures has been freely taken to in Chikodi and Hukeri Talukas of the Belgaum District, and in the Gokak Canal tract.

(4) *Trial of early varieties of groundnut.*—Cultivation of Spanish Peanut variety is largely extending in Haveri Taluka and Mundargi Petha of the Dharwar District.

(5) *Trial of jowar varieties given by the Cotton Breeder,* viz. *(Nandyal, Muddinandyal, Bilchigan and Mahisal).*—The season for jowar was not good and trials need repetition.

(6) *Trial of wheat varieties, Local, Bansi, Pusa No. 12 and Pusa No. 4.*—The season for wheat too was very bad and experiments need repetition Bansi wheat has given better results than others and its cultivation is gradually extending round Harobelvadi and Aminbhavi in Dharwar Taluka and in parts of Navalgund Taluka of the Dharwar District.

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*Bulletin No. 107 of 1921 on Gonaga—a weed in drilled paddy by Mr. S. S. Salimath, B.Ag.

(7) *San green manuring in the transition tract where supply of farm yard manure is scarce.*—The crop grew very well and was ploughed in but the season for the succeeding crop wheat was bad and effects of green manuring were not manifested.

(8) *Introduction of turmeric crop.*—The trial at Bailhongal was very successful. In an area of 8 gunthas a yield of 30 maunds of dry turmeric and 60 maunds of seed sets has been obtained. The results of this experiment have induced a large number of cultivators to go in for this crop, and the District Agricultural Overseer, Bailhongal, was deputed to Satara to secure the quantity of seed required.

(9) *Trial of Upland cotton as a row crop in Udid*—This was tried with great success at Aminbhavi, a village in Dharwar Taluka and has attracted a good many cultivators.

Propaganda.

44. *Demonstrations of improved Implements (Iron ploughs, Circular chaff-cutters, Disc harrow, Iron scraper and Wheat-thresher).*—They were 28 in Dharwar District, 20 in Belgaum District and 49 in Bijapur District. The use of iron ploughs is steadily extending. The prices of Kirloskar Brother's iron ploughs have gone down to half and many cultivators purchased them. The business of hiring out these iron ploughs by associations, societies and middlemen *did not prosper*, as it did in previous years. Disc harrow and circular chaff-cutters have attracted the attention of cultivators. The wheat crop was very poor and the demonstrations of wheat thresher were not very attractive. Ploughing competitions were held in two places in Bijapur District and four places in Belgaum District.

45. *Demonstrations of Gul-making, Nahan Cane crushing mill and Poona furnace.*—These were two in Dharwar District, four in Belgaum District, and two in Bijapur District. The use of Nahan mills is fast spreading especially in the Mallad Talukas of the Belgaum District. The Poona furnace has passed the stage of demonstration in Belgaum Mallad, but elsewhere needs more.

46. Other demonstrations were of new method of planting cane in nine places and the use of prickly pear as a famine fodder in three places.

47. *Propaganda against smut.*—In most of the demonstrations above referred to, steeping jowar seed against smut was shown to the people. Besides these, at sowing time a series of demonstrations was specially arranged. They numbered 15 in Dharwar District, 11 in Belgaum District and 50 in Bijapur District. The propaganda was mainly done through the Revenue officers in obedience to

Government Resolution No. 6799, dated 19th February 1923. The number of packets distributed and used is given below:—

Name of the District.	Number of packets distributed.	Number of packets used.	Remarks.
Dharwar ...	31,000	13,315	
Belgaum ...	20,500	8,325	
Bijapur ..	12,000	3,434	

In Bijapur District and the eastern parts of Dharwar and Belgaum Districts season for jowar was not favourable and a number of packets remained undistributed. The Mamlatdar of Hukeri and Mahalkari of Murgod in Belgaum District and Mamlatdars of Ranebennur, Haveri, Shiggaon and Ron in Dharwar District did good work.

Organisation.

48. The District staff every now and then inspected the existing agricultural non-credit societies in their charge and prepared grounds to start new ones.

49. *Seed and Implement Societies.*—They are 34 in number—23 in Dharwar District, 7 in Belgaum and 4 in Bijapur District. The business done by these societies in hiring out implements is not in any way encouraging. All these societies together own only 160 ploughs—very few indeed. Attempts are being made to increase the number. The business done in seed is fairly good. In all, cotton seed (mainly Dharwar No. 1 and Gadag No. 1) worth Rs. 16,741 was purchased by 28 societies from the Cotton Sale Societies and distributed in their villages. The District staff with repeated advice has been attempting to induce these societies to forecast their indents in advance. Gadag-Betgiri and Devi-hosur Seed Societies have done more work than others.

50. *Manure Societies.*—Belladbagewadi Manure Society distributed groundnut cake worth Rs. 958 and earned a commission of Rs. 84. Kabbur Society was not doing any work and it was revived. It has distributed 25 bags of groundnut cake and 6 bags of Ammonium Sulphate worth in all Rs. 787 and has earned a commission of Rs. 34. These are the only two Manure Societies situated in the cane tract of Belgaum District. There is large scope for Co-operative Manure Supply Societies in this tract since middlemen are already playing their part. The societies at Kabbur and Bellad-Bagewadi were not being well managed, and efforts are being made to improve them.

51. *Cattle Breeding Societies.*—Sadalga, Ainapur, Hiremallur, Karur and Sidenur Cattle Breeding Societies have considerably improved and have realised the benefits of such societies. All these societies are thinking of building common cow-sheds outside the

villages. Three societies started in the famine tract of Mundargi Petha have no prospects. The Dharwar Cattle Breeding Society with its farm outside the town has not been able to show any progress. Inadequate management and want of water supply are the main drawbacks and efforts are being made to attend to these. Other societies have just commenced their operations.

52. *Dairy Societies.*—The Dairy Society at Belgaum has done good business. It has sold 1,26,000 lbs. worth Rs. 14,150. The Gowlis are thinking of having a Housing Society. The Hubli and Bagalkot Societies have done only fair business. In all these societies, both consumers and producers are members of the society and their interests clash. More producers' societies are what are needed.

53. *Cotton Sale Societies.*—Among all the Agricultural Non-Credit Societies, these have played a very useful and important part and seem to have a great future before them. The success is largely due to the introduction of improved types of cotton and the method of selling them by auction after grading which have attracted the attention of millowners and exporters and have enabled them to offer due prices which cannot be obtained in the existing ordinary market conditions. The total number of dokras sold by different societies in auction sales is 32,938 (Dharwar—1,060, Hubli—14,643, Gadag—15,626, Haveri—1,167 and Bijapur—432). The rates realised in auction sales for Dharwar No. 1 and Dharwar No. 3 cottons were on an average Rs. 20 and Rs. 12 more than those for Ordinary Kumpta and for Gadag No. 1, Rs. 40 more than those for Dharwar-American. The extra profit realised by cultivators for these 32,938 dokras is estimated to be Rs. 2,55,240. Hubli and Gadag Sale Societies continued to do good business. Haveri Sale Society was put to proper work and this and Dharwar Sale Society sold their cotton by sample at Hubli. Bailhongal and Annigeri Societies sold their cotton by private treaty. Bagalkot failed to respond and Bijapur Sale Society was newly started.

54. *Other Sale Societies.*—The Chilly Sale Society at Byadgi has sold 978 Bengali Maunds of produce worth Rs. 21,017. The season for chilly crop was very poor during the year and the business done by the society is fairly good. The Seed-Organiser, Mr. R. S. Patil and the Honorary Organiser Mr. Mannbasangouda Patil did considerable propaganda for this society which will have its effects during the coming season.

Tobacco Sale Society at Nippani sold 1,569 Bengali Maunds of produce worth Rs. 46,019 and earned a profit of Rs. 842. This society is not yet really a Producers' Society. Middlemen bring the produce to the society and get profits. Efforts will be made to make it more a Producers' Society. Outside buyers are yet approaching the society through dalals. There are difficulties about finance which are being solved. The method of grading tobacco is being

studied and various samples have been got analysed by the Agricultural Chemist to the Government of Bombay. Personally I have made detailed enquiries on the cultivation and marketing of tobacco crop and have prepared a note on the subject.

55. *Fencing Societies.*—Four of these in Kalghatgi Taluka referred to in last year's annual report have realised the benefits of their walls built against the ravages of wild pigs. Further attempts were made during the year to organise more societies in that very tract and extend the existing wall in both the directions. On one side the Tadas and surrounding village cultivators have agreed to form a society, and on the other 3 group societies, Nelliharvi, Bommigatti and Tavargeri. These have collected most of their share capital and have approached for registration of their societies. It is estimated that the wall will extend on one side 9 miles and on the other 11 miles. The Deputy Director, the Assistant Registrar, the Deputy Collectors, I and II Divisions and the Mamlatdars of Kalghatgi and Shiggaon Talukas of the Dharwar District have all worked together for the extension of this wall. Four group societies at Tegur, Kittur, Bidi and Arabhavi have been planned and are being worked out. The fencing societies have attracted the attention of cultivators in the Mallad tract and a number of applications are coming forth.

56. In Mundargi Petha the prickly pear referred to in the last year's report which had become the abode of wild pigs was removed from many villages. The Deputy Collector, III Division, greatly helped the movement.

57. *Joint Cultivation and Irrigation Societies.*—A good deal of Government land is lying waste in the Mallad tract of Dharwar and Belgaum Districts and attempts are being made to start a few Joint Cultivation Societies here in this tract. At Maharajpeth in Hangal Taluka a big scheme with 700 acres of land and with Rs. 30,000 share capital is being worked. At Devagiri in Dharwar Taluka and at Yelvigi in Shiggaon Taluka two small schemes are under consideration. A Joint Mango Cultivation Society at Aminbhavi has been worked out and papers sent for registration. The society has got lands, has dug pits and has ordered 400 mango grafts to plant for the season. It is hoped that Fencing and Joint Cultivation Societies will change the aspect* of the Mallad tract. Two Irrigation societies, one at Maharajpeth and the other at Kittur are being worked out.

58. *Taluka Development Associations.*—Among 7 Associations started during the last year, Dharwar, Indi and Chikodi Associations did good work. They conducted various experiments and demonstrations and did good propaganda. Gadag and Gokak Associations had to dispense with the services of their fieldmen and are in search of new men. Athani Association suffered in its boring work, and Ron

* *Vide* pages 4 and 5, Bulletin No. 110 of 1922 (Year Book of the Agricultural Department in the Southern Division). Article by T. Gilbert, B.A., and S. S. Salimath, B.Ag.

Association failed to respond. Only Chikodi and Gokak Associations have collected good funds. Others have not progressed well with their collections. The District staff is working with these Associations but regular funds are not coming forth. If Taluka Development Associations are to be purely propaganda bodies, all Local Credit and Non-credit Societies should be made to regularly contribute their quota, otherwise these bodies should take up business side by side with propaganda.

To collect subscriptions from individuals has been difficult and has only been possible in Chikodi and Gokak talukas where Revenue Authorities have taken interest. Mr. Palekar, the Deputy Collector, II Division, Belgaum, has taken personal interest in these Associations and has done considerably good work. There is a good future for these Taluka Development Associations and I personally feel that they should do both business and propaganda to start with. Two new Associations in Hangal and Hirekerur Talukas in Dharwar District, one in Sindgi Taluka in Bijapur District and one in Parasgad Taluka in Belgaum District are being worked out by the District staff.

The District Agricultural Association, Dharwar, which did pioneer work in past years is now losing grounds. Various Taluka Development Associations and Non-credit Societies have taken its work. Its work of hiring out iron ploughs too was considerably reduced owing to fall in prices of iron ploughs which has enabled cultivators to purchase their own ploughs. Its magazine is improving.

A certain relation between the co-operative bodies and this Association is needed, and a committee has been appointed to consider the question.

59. *District Cotton Work.*—This continues to be the important work of the Department in the Southern Division. Experiments were laid out in 8 places to test the merits of Dharwar No. 1 Cotton against Ordinary Kumpta. In 6 places out of 8 the yields of Dharwar No. 1 are better, in one place equal, and in one place less than Kumpta. The trial of Gadag No. 1 against N. R. at Ahirsang in Indi Taluka of Bijapur District is distinctly in favour of the former. Attempts are being made to replace short-stapled N. R. Cotton by Gadag No. 1 in Bijapur area. The advantages of Gadag No. 1 Cotton over Dharwar-American have been proved in previous years and need no more experiments.

60. The growth of these improved types Dharwar No. 1 and Gadag No. 1 Cottons, is rapidly extending round Hubli and Gadag respectively. The cotton staff supervised the pedigree seed farms and has further been able to establish two blocks of 5,000 acres each in compact areas, one for multiplication of Dharwar No. 1 at and round Sharewad near Hubli and the other for multiplication of Gadag No. 1 at and round about Hulkoti near Gadag. Farm seed was grown in pedigree seed farms under close supervision of the cotton staff. Seed obtained from the produce of pedigree seed farms was sown in these 5,000 acre blocks

and the seed from selected lots obtained from these blocks was preserved for general distribution. The District staff of the Agricultural Department and the Cotton Sale Societies did considerable propaganda for the spread of these cottons. 38 Depots were opened for seed distribution. Dharwar No. 1 is gradually extending from Hubli to Haveri Taluka and Gadag No. 1 from Gadag to Bijapur area. The area under Dharwar No. 3 continues to be limited. The total area under these improved types actually sown with seed of known purity reached figures as follows :—

		Acres.
Dharwar No. 1	...	74,963
Dharwar No. 3	...	5,040
Gadag No. 1	...	65,044
Total	...	1,45,047

61. Nearly one-third the produce of this area was sold in auction sales arranged by the Sale Societies and fetched Rs. 2,55,240 extra profits to the cultivator (*vide* para. 53). The stuff was graded by the Cotton Staff. The remaining two-third quantity was sold in other ways and the extra profits realised cannot properly be estimated, but can roughly be taken as 3 lakhs. Thus the spread of improved cottons mainly Dharwar No. 1 and Gadag No. 1 has resulted in an extra profit of 5 lakhs and a half during the year.

62. The co-operative seed and sale organisation is not keeping pace with the spread of these varieties. Adequate and more timely finance to the cotton grower is what is really needed and this can be brought about by organic relation between Cotton Sale Societies and District Central Banks on one side and Cotton Sale Societies and Rural Credit Societies on the other, which is wanting at present. With the spread of improved varieties of cotton, there is a great future for co-operative cotton sale and I am working with various bodies concerned to solve the question of finance. The yields and prices of these two cottons, and the propaganda done by the District staff, the Seed Organiser and Cotton Sale Societies have encouraged the cultivators to a great extent; and it is hoped that the area under these two cottons will considerably increase during the next season. The Cotton Sale Societies at Hubli and Gadag have stocked in all 686,000 lbs. Dharwar No. 1 and 650,000 lbs. Gadag No. 1 seed of known purity for distribution during the coming season which will suffice for an area of 86,000 acres and 82,000 acres respectively. The demand will certainly be more than the societies can meet and the middle men will continue to play their part. They have also stocked a good deal of quantity especially Gadag No. 1 seed, the demand for which from Bijapur area is very great.

63. The cotton clean picking propaganda was continued by the District Staff and Cotton Sale societies and prizes were awarded. This will have its effect on the nature of cotton picking during the coming season.

64. The Cotton Transport Act was brought into force and has worked satisfactorily in the Southern Division. The import of inferior cottons like Bengal and Irani and mill waste through rails has altogether been stopped and the quality of both Kumpta and Dharwar-American Cottons considerably improved. The Gadag merchants complained that their market will considerably suffer if equally good cotton coming from the adjoining Nizam's Dominions and Madras Presidency is prohibited to come in. The Director of Agriculture arranged to issue licenses and the Cotton-Overseer was entrusted with the work. Illicit import did take place to a certain extent through roads. A case was presented to the Magistrate but only cartmen became liable for punishment under the existing wording of Rules under the Act. The rules need modification in wording and I have represented the matter to the Director of Agriculture. The import of short stapled Sholapur Cotton by road into Bijapur market also did take place; and Nakas are what are needed on the border. The import by road is, however, insignificant when compared to that by rail. The Cotton Transport Act has considerably improved Hubli and Gadag markets which are the biggest markets in the Southern Division, and has worked both in the interest of producers and consumers.

65. *Boring Work.*—This was another important work which was much appreciated by cultivators and people in general. Many of the wells dried up during the year and demand for boring was great. Work in Dharwar and Belgaum Districts was done in concentrated areas and two machines worked in each of these Districts. Only one machine did work in Bijapur District, mainly under the direction of the Collector for drinking purposes.

66. In all 59 bores were taken against 18 last year and the total depth bored was 3,533 feet against 1,164 feet. The following table gives details :—

District.	Purpose.	No. of bores.	Successful.	Failure	Rejected.	Incomplete.
Dharwar ...	Agriculture ...	21	16	1	4	...
	Drinking ...	12	11	...	...	1
Belgaum ...	Agriculture ...	8	1	3	3	1
	Drinking ...	10	4	5	1	...
Bijapur ...	Agriculture ...	3	1	2	...	...
	Drinking ...	5	3	...	1	1
	Total ...	59	36	11	9	3

Out of these 59 bores, 32 bores were for agricultural and 27 for drinking purposes.

67. The percentage of successful bores in the Division is 79·59 (Dharwar 96·42, Belgaum 38·4, and Bijapur 66·16). The work at Savanur and Kundgol in Dharwar District was exceedingly good. All the 14 bores at Savanur were successful. The betelvine gardens were suffering badly from want of water and these bores saved the situation. Similary 10 bores were successful at Kundgol where water-supply was very scarce and was a crying need. The work in these two places has been much appreciated. In Belgaum District the tract round Nippani and Bhoj does not seem to be suited to boring. There are very few underground currents. Yeksamba seems to be fairly good. In Bijapur District Muddebihal is not favourable whereas Bagalkot is good.

68. There were 11 accidents and all of them were removed as early as possible. The work done on the whole was far better than in previous years and reflects credit on the Boring Assistant. The Boring Department worked at a profit of Rs. 1,902. The total receipts were Rs. 7,621 and the expenses came to Rs. 5,719.

69. The Mechanical Assistant erected a new oil engine on the Gokak Farm and attended to repairs of cane crushing mill and centrifugal pump there. He has fixed an oil engine and countershaft on Bankapur Farm and further work of fixing corn mill and chaff-cutter is in progress. He inspected occasionally Dharwar Farm and Devi-hosur school machinery and gave advice. In the District he attended to the repairs of three existing pumping plants and erected two new ones. Besides he inspected 5 new pumping sites and prepared plans and estimates.

70. *Embankments*,—The special officer appointed for bunding work prepared 34 schemes during the year, 15 in Dharwar District, 13 in Bijapur District and 6 in Belgaum District. The number of applications for advice on bunding considerably increased during the year and with a view to discourage idle and indifferent applications a deposit system has been introduced. Construction of work is in progress in 11 places, 6 in Dharwar and 5 in Belgaum District. Some plans deal with surface erosion and conservation of moisture while others offer problems of controlling fairly large nallas with a view to accumulate silt.

Agricultural Education.

71. The Agricultural School at Devi-hosur completed its 10th year. 52 applications were received during the year for admission but only 12 admitted on rigid selection, after personal interview. The total number of students was 22 in the two classes, 12 from Belgaum District, 7 from Dharwar District, 2 from Karwar and 1 from Bijapur District. The curriculum remained the same as last year but more time was devoted to practical farm work and cottage industries than in previous years. The students were taken on tour

to Satara and Belgaum Districts to show them the cultivation of garden crops which could not be undertaken on the school farm owing to want of water-supply. All the 12 students in the first year and 8 students in the second year who appeared for the examination passed during the year.

72. Three 2nd year teachers were trained here for vernacular schools with agricultural bias to be opened one in each District, Dharwar, Bijapur and Karwar accordingly to the scheme laid down by Government.

73. The total expenditure of the school was Rs. 8,041 and receipts Rs. 2,566. The school is gaining popularity.

Miscellaneous Work.

74. The Divisional Board held its quarterly meetings regularly and an extra-ordinary meeting and discussed various subjects of importance. All the members official and non-official were regular in their attendance.

75. With a veiw to train District Agricultural Overseers in organising work and Organizers in agricultural propaganda and 5 new graduates in both, a training class was arranged for a fortnight. Junior fieldmen on the Dharwar Farm also attended the class. The Deputy Director, the Assistant Registrar, the Farm Superintendent, the Cotton Breeder, and the Cotton Superintendent took various classes. Mr. Nalwadi, the President of the Karnatak Branch Institute and Mr. Jog, M.L.C., also gave some lectures on co-operation. Various subjects concerning improved implements, manure, seed, method of farming and organisation of different agricultural non-credit societies were explained and discussed. It is hoped that this training class will be of much use to the officers concerned.

76. A Divisional Conference of all the Heads of Sections was organised when the work done and to be done by various sections was freely discussed. At the time of this Conference all Taluka Development Associations were invited and programme of work for each taluka was prepared in consultation with the Association and the District Officer concerned. This Conference had a very educative value and made various officers and Taluka Development Associations understand each other's work.

77. A series of training classes was organised by the Assistant Registrar which I personally attended and delivered lectures on the subjects concerning agricultural non-credit co-operative movement. Myself and the Assistant Registrar undertook some joint tours to conduct these training classes. The advantages were that many non-official gentlemen and co-operative societies were made to take more interest in the agricultural improvement.

78. The District staff attended to many individual calls for advice on different matters concerning mainly crop production, fruit cultivation, and bunding. 149 Takavi loan applications for land improvement were dealt with. Various sites were inspected and estimates of schemes made.

79. I have prepared two notes one on Tobacco Cultivation and its marketing, and the other on cake manure to paddy crop. The latter has been submitted to the Director of Agriculture, B.P., Poona, for publication as a leaflet.

General.

80. My office is now required to work direct with 20 Heads of Sections, 7 Taluka Development Associations and 67 Non-credit Societies besides Revenue Officers and individuals. The work of the Divisional Board has also very much increased. An additional clerk is a bad need in my office.

The staff in general has put in very good year's work. The duties of the District staff are so widening that I cannot but repeat the remark I made last year that each officer badly needs a Kamgar under him.

81. Many Revenue Officers and private gentlemen considerably helped our demonstrations and organisation work and my thanks are due to them. The Assistant Registrar practically worked with me in organising work and Rao Saheb M. L. Kulkarni, the retired Deputy Director of Agriculture, helped me with his occasional advice. Among non-official gentlemen Rao Saheb S. S. Mangsuli of Athani, Mr. M. S. Patil of Hukeri, Rao Bahadur Mallanaik Patil of Bailhongal, Mr. Virupaxeppa Marihal of Kittur, Mr. S. M. Gowri of Khanapur, Mr. Paramshetti Kadappa Patil of Gokak and Messrs. V. S. Phathapekar and V. V. Shirgaonkar of Belgaum in the Belgaum District, Rao Saheb Pampapati Desai of Aminbhavi, Messrs. F. T. Nalwadi and S. V. Desai of Dharwar, Rao Saheb C. S. Shirhatti of Hubli, Khan-Saheb Khudawand Muhammad Ghaus of Navalgund, Mr. M. V. Koti of Gadag, Mr. Shiddangouda Patil of Hulkoti and Messrs. Kubihal and Shetti of Alur in the Dharwar District, and Rao Saheb S. J. Deshamukha of Almel, Rao Saheb P. G. Halkatti of Bijapur, Mr. G. C. Limaye of Bhatkunki, Mr. Satappa Gunari of Sindgi deserve special mention. I must express my opinion that the activities of these official and non-official gentlemen have roused the local interest for agricultural improvement in various parts of my Division.

In conclusion I am glad to make a mention that the Hon'ble Mr. A. M. K. Dehlavi, Bar.-at-Law, J. P., Minister for Agriculture and Co-operation, took a tour in Belgaum and DharwarD istricts and paid visits to Dharwar and Tegur Farms and many Agricultural Co-operative Institutions. His visits were very valuable and encouraging.

S. S. SALIMATH,

Ag. Dy. Director of Agriculture,

S. D., Dharwar

APPENDIX F.

SUMMARY OF WORK DONE BY THE DEPUTY DIRECTOR OF AGRICULTURE, GUJARAT DIVISION, FOR THE YEAR 1923-24.

I. Staff.

I was in charge of the Division throughout the year.

2. Practically there was no change in the organisation of the subordinate staff except the addition of the post of a Head Master for the newly opened Vernacular Agricultural School at Surat.

II. Experimental and Research Work.

(1) Cotton Breeding at Surat and Broach.

3. The whole of the cotton area of the Surat Farm was sown with the seed propagated from pure bred strains of 1027 A. L. F.

The seed propagated from selfed flowers becomes sufficient for sowing on the Surat Farm cotton area in the third generation, and the resulting seed is distributed in the Athwa group for the next season.

A comparative trial of this strain with the local cotton gives the following results :—

Variety.	Yield in lbs. per acre.	Ginning percentage.	Length of fibre in centimeters.
Surati Local ...	601¾	35·5	1·75
1027 A. L. F. ...	667	35·9	2·23

This strain is valued at Rs. 55 more per Khandi than the ordinary Surat cotton by the Mill Owners Association, Bombay. The work on crosses is being continued with the object of still further improving the strain, and the results are very promising.

4. The crosses between the two pure bred strains of Broach and Goghari E_5 have reached F_4 generation. The segregates which seem to be more near the desired types will be tested at Surat and Broach, as it is found from the cotton survey of Halol Taluka made by Mr. M. L. Patel and that of the Broach Tract made by me, that any improved stapled strain, with a ginning percentage of lint lower than 39·5 will not be appreciated by the cultivators so long as the relative prices of stapled cottons do not rise. Hence the strain Selection I A will not be multiplied but it is hoped a suitable segregate from the crosses will be available shortly, which will be multiplied and distributed in the Broach tract.

5. As reported in paragragh 5 of the last year's annual report a very substantial sum was placed at the disposal of the Director of

Agriculture, B. P., by the Indian Central Cotton Committee to start cotton research work at Surat. A Cotton Physiologist and a Cotton Entomologist with an adequate staff and a laboratory have started work in right earnest, though little late, with promising results in the near future.

(2) Cotton Breeding at Viramgam.

6. In spite of the failure of the monsoon in the North Gujarat during the year, the cotton crop at the Viramgam plot yielded 400 lbs. of Kapas per acre, *i.e.*, about 190 to 230 lbs. more than the surrounding cultivators' crop, owing to special attention to better cultivation.

All the five strains of Wagad Cotton of last year were again tried and found to maintain the same characters with the following results :—

Plot No.	Name of the strain.	Yield of Kapas per acre.	Ginning per-centage.	Valuations by Messrs. R. D. Tata & Co.	Length of staple in centi-meters.	Remarks.
		Lbs.		Rs.		Good for
2	Wagad 14 ...	426	41·1	590	1·92	16's
3	Wagad 8 ...	434	41·0	590	2·0	16's
4	Wagad 12 ...	458	40·7	590	2·0	16's
5	Wagad 4 ...	416	37·5	610	2·1	20's
6	Wagad white flowered.	880	30·8	590	1·95	16's

Wagad No. 4 has again proved to be the best strain of all the above five in point of length of staple, feel and valuation. It has got only one weak point, *viz.*, a little low ginning percentage as compared with the rest.

Wagad seeds from the four principal noted places, *viz.*, Mandal, Viramgam, Patdi and Jagudan, were obtained during the year 1922-23, and the home grown seed of these varieties was grown on 7 guntha plots each for comparison as to how far the five strains are superior to them and also to find out a suitable material for further selection. The results are summarised below :—

Plot No.	Name of the variety	Yield of Kapas per acre.	Ginning per-centage	Valuations by Messrs. R. D. Tata & Co.	Length of staple in centi-meters.	Remarks.
		lbs.		Rs.		
7 & 9	Local Mandal ..	439	35·8	575 to 580	2·0	12's
10	Local Viramgam ...	411	36·0	„	1·96	„
11	Local Jagudan ...	411	36·5	„	1·9	„
12	Local Patdi ...	366	37·4	„	1·9	„

This is on basis of valuation on 3rd May 1924.

Fully good Viramgam at Rs. 600 per Khandi of 784 lbs.

Fine Broach at Rs. 600 per Khandi of 784 lbs.

It will be seen that our five strains except Wagad white flowered are superior to all the local cottons as regard ginning percentage and quality of fibre.

Multiplication of seed.—During the year under report 366 lbs. of seed in all of the four strains No. 14, 12, 8 and 4, was distributed in the villages of Sokhli and Gedia. But owing to the failure of monsoon the cotton crop entirely failed, even though the fields at Sokhli were commanded by wells, which also failed. During the current season very nearly the same amount of seed has been distributed in the villages of Sokhli and Jakhawada and sown in fields with better facilities of irrigation.

(3) *Jowar Breeding at Surat.*

7. Unit Selection was continued in 17 selections of which only 5 appear to be promising of which 4 are from Perio and 1 from Chapti.

They were compared with the local variety in alternate strips with the following results :—

Yield of grains in lbs. per acre of :—

train.		Lbs.	Local.	Lbs.
A. D.$_4$	...	942·4	Local.	812·5
A. D.$_6$	...	1,088·0	„	840·8
M T.$_1$	...	846·9	„	803·0
M. T.$_7$	...	897·1	„	735·9
Chapti$_8$	...	910·9	„	846·3

From the above it will be seen that A. D.$_6$, is the best. It will be grown on a large scale next year for further propagation.

M. T.$_7$ has a superior quality of grain and it may turn out to be a suitable type for yield as well as quality. The work is being continued for maintaining the purity of the strains for further crossing and for studying further the character of the jowar plant.

(4) *Tobacco Breeding at Nadiad.*

8. 32 Promising strains were sown from selfed seed in the year under report for three different objects, *viz.*, (1) for obtaining selfed seed from the best selected strains for further studying the flower and vegetative characters, (2) for studying the leaf characters and also the comparative yield of the strains among themselves, and (3) comparing each of the purified selected type with each of the four recognised varieties, *viz.*, Gandiu, Piliu, Keliu, and Shengiu

on a large scale. From the above 32 strains only 12 promising and uniform ones from selfed seed will be continued.

Name of the strain compared with the local variety of the same type.	Yield in lbs. per acre of cured leaf.	Remarks.
Strain No. 1 ...	1,638	
Gandiu, Local ...	1,404	
Strain No. 30 ...	1,430	
Piliu, Local ...	1,300	
Strain No. 15 ...	2,148	
Keliu, Local ...	2,028	
Strain No. 22 ...	988	
Shengiu, Local ...	832	

From the above it will be seen that each of the strains 1, 22, and 30 is far superior to each of the corresponding local varieties. The seed of these promising strains is given out to intelligent cultivators for trial in their original localities.

9. In tobacco, the differences in prices due to quality are almost as great as those between different varieties of cottons. Therefore, the primary object of this Station is to segregate high yielding strains having intrinsically good qualities as appreciated by the local market and if possible by the exporters. It has been decided to study the question of manuring from the next year and the question of curing will be handled still later.

(5) *Surat Agricultural Station.*

10. *Cotton.*—Cotton seed of 1,027 A. L. F. sufficient to sow the Farm area was supplied by the Breeding Branch. The total area under cotton was 69 acres 10 gunthas, which yielded 469 lbs. per acre as against the average yield 371 lbs. in the surrounding Athwa group villages. From this, 18,400 lbs. of pure seed was obtained for distribution in the Athwa group villages.

Jowar.—The total area under jowar was 67 acres and 38 gunthas and the average yield per acre was 972 lbs.

11. *Ridging Experiments.*—The original plan was modified a little, last year, as reported under para. 10, page 77 of the last year's annual report. In cotton the two years' results show that there is an average increase of 15 to 23 per cent. by simple ridging and shallow and deep intertillage respectively without any manuring; and of 41 per cent. by ridging, deep intertillage in the furrows, and the application of 10 tons F. Y. M., all applied in the furrow. But the results were not so encouraging in the case in which the manure was applied 75 per cent. in the furrows and 25 per cent. on the top as compared with the above.

Similarly in the case of jowar the average results of two years show an increase of 23 per cent. more in grain and 10 per cent.

more in fodder by simple ridging and deep intertillage in the furrow without any manure over that sown on the flat. In the plots ridged and manured as above increase of grain ranged from 24 to 31 per cent. and that of fodder from 29 to 36 per cent. over the flat system. Even in this case the plots ridged and manured in trenches gave better results than those in which 75 per cent. of the manure was given in trenches and 25 per cent. on the top.

From the last year's experience it can be said that sowing on ridges gives better results than that sown on the flat and the cultivators of the surrounding villages are very keen to adopt this method if the ridges could be easily and cheaply made in the hot weather. In all, in the surrounding villages 285 acres were sown on ridges prepared by one paired implements lent from the farm. Not only that but they have purchased these implements worth Rs. 1,579 and still the demand for the purchase is pressing. The farm is supplied with a case tractor but as it was received rather late no advantage was either taken by the farm or given to the surrounding cultivators. However, it is hoped that it will help materially in preparing ridges at a fairly cheap cost and eventually in extending this system in the district.

12. *Breeding Herd.*—The purity of the Kankrej herd is very scrupulously maintained. The strength of the herd on 1st April 1924 was 108 as against 94 of the last year. The total milk yield was 76,257 lbs. and 12 ozs. of 32 cows as against 78,800 lbs. of last year of 42 cows. From these 32 if we deduct 2 heifers, which calved in March, and an old cow, the average yield per cow comes to 2,618 lbs. as against 2,477 lbs. of the last year.

At present there are six cows in the dairy whose annual average of more than five years is about 3,000 lbs. Two best cows of the herd Anpurna and Bhuli both sisters have given 3,516 and 3,847 lbs. of nine years, and five years and ten months' average respectively. Cows Budhi and Lehra reported to be very good milkers are getting old but their yields have not gone down 3,000 lbs. Daughters of Bull Mohan by mother Budhi have begun to cow and two of them have given more than 3,000 lbs. during the year under report.

13. *Premium Bulls.*—During the year under report the system of giving out bulls on premium system was introduced and in the course of six months the dairy was able to distribute six bulls in the Surat and Broach Districts.

(6) *Broach Farm.*

14. The same work of evolving suitable types of cotton for the Broach tract is continued and the Breeding Branch hopes to put out a strain shortly in the district which will compete with local Goghari mixture in ginning percentage and will have the staple equal to that of Selection I A.

15. The selection work of Rabi jowar was continued but on account of very deficient rainfall it was not possible to propagate seed of the most promising strains.

16. Nitrate of Soda was further tested, as reported last year, on cotton at the rate of 135 lbs. per acre and it has kept up its reported increase. The average increase in yield from the last three years' results comes to 576 lbs. per acre for the manured plot as against 386 lbs. of the unmanured, *i.e.*, the yield is nearly 50 per cent. more. The manure has been recommended to intelligent cultivators during the current season.

(7) *Dohad Farm.*

17. *Wheat Seed Selections and Multiplications.*—Wajia x Popatia Cross for which very high hopes were entertained as to its rust resistant quality was found to be badly affected with rust along with others; though in point of yield it had kept up its reputation.

Pusa 4 and Baxi.—These two varieties of wheat were being grown on the farm on a large scale for purposes of seed distribution. All the seed grown on the farm was distributed through the Co-operative Bank of Dohad. During the year under trial two more varieties of wheat, *viz.*, Pissi and Pusa 12 were tried on the farm for comparative yield. The following statement shows the yield :—

Name of the variety.	Yield per acre in lbs.	Remarks.
(1) Pissi ...	1,463	
(2) Baxi ...	1,143	
(3) Wajia x Popatia Cross ...	1,131	
(4) Pusa 4 ...	1,152	
(5) Pusa 12 ...	1,114	
(6) Wajia ...	1,175	

From the above it will be seen that Pissi has yielded nearly 300 lbs. more per acre, whilst the rest are almost all on a par.

18. *Cultural Experiments—Wider planting of Maize.*—The same experiment as in previous years was continued. The sowing of Maize 2′ apart as against the local practice of sowing 15″ to 18″ apart during the last six years has given an average increase of 25 per cent. over the local method. The new method of sowing by a drill 24″ apart instead of by a plough 15″ to 18″ apart is advocated in the tract and specially amongst the Bhills.

(8) *Amalsad Farm.*

19. The *Red Rot* in sugarcane did not appear this year too. But the canes were badly affected by mite disease and on account of irregular and scanty rainfall yield was not good and although there was a very keen demand for seed, it could not be met with fully on account of diseased canes. The system of sowing whole canes after a Nangar, heavy plough, is being replaced by set planting in furrows and the surrounding cultivators have begun to take full advantage

of using the farm implements, specially, the ridger and the iron ploughs. They have also begun to buy artificial manures for sugarcane, ginger and chikoo, &c.

20. The growing of turmeric crop on ridges as against the practice of sowing it in beds was further demonstrated and the results of yields, *viz.*, 16,829 lbs. per acre in the former case as against 13,595½ lbs. in the latter case goes to further confirm the superiority of the ridge system over the beds system.

III. Agricultural Education.

(*1*) *Vernacular Agricultural School, Godhra.*

21. This has now completed its fourth year and is well established. The classes started with 31 boys in all, 13 being in the 2nd year and 18 in the 1st year selected out of 50 applications that were received for admission. According to caste and Districts, their number stood as under:—

(1) According to Caste:—

	No.
Brahmins	9
Dharalas	7
Patidars	13
Barot	1
Rajput	1
Total	31

(2) According to Districts:—

	No.
Kaira	17
Panch Mahals	13
Ahmedabad	1
Total	31

22. The staff, curriculum, and methods of practical training and of the school farm management remained the same as reported in past years, the farm work being done by the boys themselves. Ridge cultivation was introduced on the school farm, and the cotton on ridges yielded better, *viz.*, 440 lbs. per acre as against 305 lbs. on the flat even though the rainfall was less, *i.e.*, only about 19 inches during the year under report against the annual average of 40 inches.

23. Besides the training in agriculture given to the boys of the adjoining Dharala School, primary school teachers selected one from each of the five Districts of Gujarat were taken up for special agricultural training with a view to introduce through these teachers an agricultural bias course in the higher standards of rural schools. After successfully going through the special agricultural course at the end of the year under report these five teachers have been posted in the rural schools as under which are provided with a small plot of land for imparting practical agricultural training to the boys:—

Place.	Taluka.	District.
Waghchhipa	Pardi	Surat.
Shukaltirth	Broach	Broach.
Uttarsanda	Nadiad	Kaira.
Kanbha	South Daskroi	Ahmedabad.
Nadisar	Godhra	Panch Mahals.

Five more teachers have been again taken up for the current year.

24. In the annual examination held in April 1924, by Messrs. C. S. Patel, Cotton Superintendent, Surat and G. P. Pathak, District Agricultural Overseer, Panch Mahals, Godhra, the results were very satisfactory, 13 and 13 boys passing out of 15 and 13 that appeared in the 1st and the 2nd year respectively. From the Dharala Boarding School, seven and eleven boys in the 1st and 2nd year respectively appeared, all of whom passed.

25. Rs. 300 were received as a contribution from the District Local Board, Panch Mahals, and Rs. 500 from the Sir David Sassoon Trust Fund. The total expenditure of the School during the year under report was Rs. 8,797-6-0, consisting of Rs. 3,503-12-0 for pay and travelling allowance of establishment; Rs. 2,700 for boarding charges of the boys and the primary school teachers; Rs. 1,335-10-0 for purchase of live-stock, books, furniture, implements and miscellaneous expenses; and Rs. 1,258 for cultivation charges and upkeep of live-stock. The receipts of the School amounted to Rs. 625-2-9 for the sale proceeds of the School produce as against Rs. 196-13-2 of the last year. The average feeding charges per boy per month as verified by the Auditor amounted to Rs. 7-4-0 during 1921-22 and Rs. 7 only during 1922-23; the average cost of the whole institution per boy per month being Rs. 22 and Rs. 20-8-0 during the two years respectively, which shows that the School is being run comparatively very economically.

(2) *Vernacular Agricultural Education in the Bhil Boarding School at Dohad.*

26. The new classes began with eight boys in the 1st year and six in the 2nd year. The results of their annual examination held by Mr. G. P. Pathak, District Agricultural Overseer, Panch Mahals, in March 1924 was very satisfactory, 7 and 6 boys passing respectively from each class.

(3) *Vernacular Agricultural School, Surat.*

27. Continuance of this School started for one year as an experimental measure from 24th June 1923, has been sanctioned for another year as per G. R. No. 8133, R. D., dated 2nd May 1924. Out of 19 boys admitted in the beginning, 13 remained in the School till the end of the year under report. Their classification according to caste and Districts is given below:—

Caste.	No.	District.	No.
Anavils ...	4	Surat ...	11
Patidars ...	5	Broach ...	1
Rajputs ...	2	Sachin State ...	1
Kali Parej ...	2		
Total ...	13	Total ...	13

All these are from purely cultivating classes.

28. *Staff.*—There was only one Head Master (Agricultural graduate) and one non-graduate fieldman, as there was only one class during the year. A vernacular assistant master will be added when both the classes are full.

29. *Curriculum* is just the same as that of the Godhra School. An area of 11 acres and 15 gunthas for dry crops and a piece of 1 acre and 17 gunthas for garden crops were set apart from the Surat Farm for the use of the School boys and necessary implements with two pairs of bullocks with ploughman were also given to the School from the Surat Farm. The School will be gradually equipped as funds will be available.

30. Out of Rs. 5 000 (2,500 sanctioned by Government and Rs. 2,500 contributed by the Surat District Local Board), the total cost of the School during the year was Rs. 4,780; consisting of Rs. 1,500 for cultivation charges; Rs. 1,580 for Boarding charges; Rs. 1,500 for the rent of the bungalow hired for the School, and Rs. 200 for miscellaneous expenses including postage. The sale proceeds of the School produce amounted to Rs. 34-11-8.

31. Out of 13 boys, 8 passed in the annual examination held in April 1924 by Messrs. T. V. Nagarsheth, District Agricultural Overseer, Surat and J. G. Naik, Head Master, Vernacular Agricultural School, Godhra. The results seem to be promising. 17 New students have been taken up in the 1st year, so in all in both the classes the total number of boys is 30. Of the new batch two students from Cambay State have joined the School at their own cost.

(4) *Publication of Agricultural Matters.*

32. The publication of the Broach Quarterly Magazine was continued as usual, 26 articles in all being supplied by the Agricultural Staff in the Division.

Agricultural notes are being supplied to the Publicity Committee, recently established at Poona, for publishing articles on agricultural matters in local papers co-operating in the matter.

Mr. M. L. Patel's Memoir, "Studies in South Gujarat Cottons, Part II" was published.

IV. Propaganda Work.

33. *Divisional Board.*—The Divisional Board of Agriculture, Gujarat, established last year, held four meetings during the year under report. In addition, the Gujarat Divisional Cotton Committee attached to the Board held its Special Meeting on 9th December 1924 to consider the complaints from the cultivators and the trade about the Cotton Transport Act and it was attended by a Sub-committee of the Indian Central Cotton Committee.

The work of the Board was very gratifying in bringing about the closer co-ordination of the Agricultural and the Co-operative Departments; and in controlling and extending propaganda work in concentrated areas.

34. *District Cotton Work.*—The work is being continued as per settled policy during previous years. The total area under the control of the Department was 9,146 acres 6 gunthas against 8,400 acres of the last year. The cotton was ginned at the following gins:—

(1) Messrs. Tata and Sons' Gin, Navsari.

(2) Messrs. Whittle and Co.'s Gin, Bardoli.

(3) Messrs. Narandas Rajaram and Co.'s Gin, Sania.

The total quantity of Kapas ginned at these centres amounted to 2,788-13-28 Bhars = 66,925 Maunds and 28 seers, the quantity of lint obtained from this came to 1,108 Khandis 14 mds. and 3¼ seers (about 2,217 full pressed bales). Most of this was purchased by the two well known firms of Messrs. Narandas Rajaram and Co. and Messrs. Rally Brothers at a premium varying from Rs. 20 to Rs. 25 per Khandi and the Department is thankful to both of them. The lowest rate obtained by cultivators was Rs. 300, while the highest was Rs. 337 and they seemed to be satisfied with the rates realised.

Cotton Seed Distribution.—The total quantity of seed purchased from the controlled area was 1,749,650 lbs. and no second class seed was purchased by the Department, as it was not found advisable to do so from past experience. The whole lot was disposed of as under:—

	Gallis.	Mds.	Srs.		Lbs.
The Rajpipla State ...	742	0	0	=	890,400
The Baroda State ...	59	15	0	=	71,400
British Districts (Six Depots).	348	3	0	=	417,720
Through other gin-owners ...	234	11	10	=	281,250
Miscellaneous demands from outside.	14	2	0	=	16,880
Reserved for resowings ...	60	0	0	=	72,000
Total ...	1,458	1	10	=	1,749,650

This is the fifth year since these operations were started and the results obtained so far are very satisfactory. The Goghari mixture percentage has gone down very much in most of the British tract, south of the Narmada, excepting a greater part of Olpad where seed of Selection I A and with it seed from the adjoining

Baroda Territory of Mangrol Taluka seem still to prevail. Similarly a part of Mandvi Taluka, which is surrounded on three sides by Baroda Territory and on the fourth side by Olpad, has a mixture seed growing. In addition to the above two, a very large part of Baroda Territory specially Mangrol and Kamrej Talukas and parts of Songadh, Vyara and other adjoining areas are not growing the Farm seed to the desired extent.

The most note-worthy feature of the year was the application of the Cotton Transport Act to the tract south of the Narmada. The people of Olpad and Mandvi raised huge cry over this Act; and consequently, had its operations been not relaxed to a certain extent, the whole area would have been purified in no time.

If the people of Olpad and Mandvi and those of the adjoining Baroda Territory try to copy the example of the Rajpipla State, the whole problem of purifying the tract of Goghari mixture becomes very simple and could be thorougly dealt with within a couple of years. During the year under report, Rs. 1,34,400 were advanced by the gin-owners to the cultivators at 6 p. c. interest and Rs. 94,500 were advanced by the Director of Agriculture, Bombay Presidency, Poona, from his Personal Ledger Account for the seed purchase and distribution operations. The total turn-over of the whole transaction comes to Rs. 11,32,400.

35. *Agricultural District Work—(a) Demonstrations and Shows.*—During the year under report 15 demonstrations and shows were held including the one at Bansda and one at Ahwa (Dangs). Under recent orders of Government the Dangs tract is transferred from Gujarat Division and now included in the North Central Division and the services of the Bhil boy specially trained at the Godhra Vernacular Agricultural School for agricultural propaganda work are also transferred to the North Central Division. Of the above 3 were party demonstrations, *viz.*, 1st on the Surat Farm, which was a great success, 2nd on the Broach Farm, and third on the Agricultural School Farm at Ambali (Godhra). In addition to these big demonstrations, about 50 village demonstrations were held by the Implement Depot Keepers and Kamgars in villages and the total area so worked came to nearly 200 acres.

(*b*) *Implement and Seed Depots.*—The depots at Godhra, Dohad, Kalol, Jhalod, Prantij and Bulsar were continued. The Implement Depot at Bulsar issued implements free of hire charges for their introduction in the backward tract; and about 20 persons took benefit of the same in working about 68 acres of land. The hire charges earned by all the other depots amounted to Rs. 47-6-0 only.

(*c*) *Distribution of Seeds, Implements and Manure.*—Various kinds of seeds were distributed in addition to cotton seed distributed by the Cotton Staff, from the different farms and by the District Agricultural Overseers amounting to nearly 80,000 lbs., consisting of new and improved types of cotton, wheat, groundnuts, &c.,

159 implements worth about Rs. 2,256 including spare parts and artificial manures about 8 tons including denaturalised salt worth about Rs. 1,200 were also distributed.

(*d*) *Demonstration Plots.*—The District Agricultural Overseers managed 142 demonstration plots on cultivators' fields covering an area of 166 acres 30 gunthas, to demonstrate different methods of tillage and manuring and improved varieties of crops recommended by the Department.

(*e*) *Measures to prevent Smut in Jowar.*—As per Government Circular No. 6799, R. D., dated 19th February 1923, vigorous efforts were made to spread through the Revenue Officers the propaganda work of steeping jowar seed in copper sulphate solution for prevention of smuts. For this purpose 21 meetings were held by Agricultural Officers to demonstrate the method and use of this solution to the officers of the Revenue Department and the cultivators.

The total number of packets of copper sulphate thus distributed was 8,582 during the year under report. Though this is a very big item in comparison with the distribution by the Department in the past years, the packets could not be distributed to the fullest extent owing to unfavourable rains that were scanty and irregularly distributed in the districts of North Gujarat. It is hoped that a more organised campaign will be carried on next year with the mutual help of the officers of the Revenue Department.

36. *Agricultural Associations.*—(1) The Chorashi Taluka Development Association which was started on 18th June 1922 continued to do very good work. It has got in all 716 members including 15 patrons. Including the amount of Rs. 1,000 subsidy from Government the total income of the Association during the year was Rs. 2,633-12-9 and the expenditure amounted to Rs. 1,829-7-8. The balance including the reserve fund on 31st March 1924 was Rs. 5,475-12-9.

The Association maintained a graduate fieldman and a Kamgar and also conducted an implement depot for giving out useful implements on hire. The main activities of the Association are demonstrations and supply of foreign implements to its members. Implements worth Rs. 120, seeds and plants worth Rs. 157-8-0 including cabage seed worth Rs. 24-4-0, and 550 packets of copper sulphate were sold from the depot. Budding of 700 country rose plants and 100 country bore trees (Zizyphus jujuba) were done in some places. An agricultural survey of the Chorashi Taluka was made by the District Agricultural Overseer, Surat and co-operative survey of the taluka was also undertaken by the Agricultural Organiser, C. S. N. D.

(2) Efforts are being made to start a similar Taluka Development Association elsewhere and one will be started in Jalalpur Taluka next year.

(3) Efforts were made to make the old Agricultural Associations in Kaira and Panch Mahals Districts rather active, by calling the

meetings and helping some of them in raising demonstrating plots of various new crops and improved methods.

37. *Agricultural Co-operative Work.*—Four new Co-operative Non-credit Agricultural Societies were started during the year, making in all 22 such societies in Gujarat. The most important out of the new ones were Power Pumping Society at Ankhalav in the Kaira District, one Power Pumping Society at Tukwada in the Surat District, and one Co-operative Ginning Society at Kareli in the Broach District.

Five out of the nine Cotton Seed and Sale Societies worked during the year. The total value of cotton and cotton seed sold by Cotton Sale and Seed Societies during the year was Rs. 6,35,929 an increase of 138·3 per cent. over the previous year's figures.

38. *Insect and other Pests*—(*a*) *Katra or Hairy Caterpillars* (Amsacta moorei).—The campaign of controlling Katras by dusting with Paris Green was again conducted during the year at 3 places, *viz.*, Dohad Farm, Galalia Falia (near Dohad) and Derol (Taluka Kalol, Panch Mahals). About 349 acres of various crops were dusted with the mixture of Paris Green and slaked lime in proportion of 1 in 20 to 1 in 25 with the result that the Katras attacking the growing crops either remained dormant or fled away by the smell of the mixture. The Katras do not seem to eat lime and so long the dusted mixture remains on the leaves they do not eat the leaves also; but as soon as it is washed away by rains or blown away by wind then they again appear and the crop has to be dusted again. In order to avoid this dusting several times this year, a trial was made to mix Paris Green with edible flours of cheap millets which being organic the Katras seem to eat them readily and die in lots. This is being further tried during the current season with every hope of success.

(*b*) *Granary Pests.*—A trial of fumigating seeds for storage against weevil attack was carried on at Dhansura and Demai in Ahmedabad District. 424 lbs. of wheat seed and 1,280 lbs. bajri seed were fumigated with Carbon Bisulphide at the rate of 1 oz. for 200 lbs. and stored in jars with the results that no weevils were found in the case of well dried seeds.

(*c*) *Wild Pigs and Jackals.*—About 210 packets of strychnine and 213 of white arsenic were distributed for poisoning trials on wild pigs and jackals. From the available reports received it was observed that due to the use of 155 packets, 47 animals were found dead. The work of carrying out poisoning trials requires strenuous attention of a special officer and the question is under consideration.

(*d*) *Jowar Stem Borer.*—Mr. Jhaveri was transferred to Poona as Assistant Professor of Entomology and the work of further investigation is entrusted to a new graduate under the guidance and supervision of Mr. Ramrao, the Cotton Entomologist, stationed at Surat. The results of this research are being published shortly in the form of a memoir.

39. *Boring.*—As mentioned in para. 24 of the last year's report 12 machines remained for working in this Division; out of which there were only 3 efficient machines (*viz.*, one Musto Power and two Musto Hand Power) the rest being Cawnpore type machines not suitable for going deeper beyond 100 feet and also working in rock.

Out of 95 applications received for boring during the year only 43 applicants sent in their agreements, the main reason for the serious fall in demand being the exhorbitant rates of boring sanctioned by Government in comparison with the rates previously charged by the Government and those of private boring contractors.

33 bores including three left incomplete last year were made in the year under report, involving a total depth of 1,757 feet out of which 19 were successful giving an increase of 21,750 gallons of water. Out of the remaining 14, four were abandoned, four failed and six remained incomplete at the end of the year. Ten applications remained unattended for want of machines to be worked in rock.

21 old bores that were choked up by sand, &c., were cleaned and set right on application from the well owners. In seven cases of old bores, pipes had to be cut in the well as their water level had gone down considerably, so that water from the bores was allowed to flow freely in the wells.

Seven accidents occurred during the year of which six were removed and trial to repair one was in progress.

During the year one of the Cawnpore machine was converted into power by attaching a small 3 B. H. P. Oil Engine which can work 3″ to 4″ bore.

At the end of the year under report it was arranged to send all the remaining eight Cawnpore type machines to the Agricultural Engineer, Poona, for modification so as to make them suitable for rock boring for working in the Ahmednagar District. It was also arranged to convert the two Musto Hand Machines into Power and to purchase one 6″ Power Drilling Machine. It is expected that these three power machines would be available for work in October next and when ready they will do very good work.

40. *Mechanical Assistance to Cultivators and Others.*—The Mechanical Assistant received in all 30 inquiries during the year under report, of which 25 were attended to and five were pending. Most important of those attended were (1) complete erection of two pumping plants; (2) inspection and repairs to eight pumping plants; (3) site survey and preparing estimates and drawings for seven proposed pumping plants; (4) repairs to one hand pump; (5) over-hauling a Fordson Tractor; (6) site survey and preparing estimates and drawing for a co-operative ginning factory at Kareli (District Broach).

The Fordson Tractor on the Chharodi Cattle Farm was overhauled and put into working order. It will now be given on hire on applications for motor ploughing from the cultivators in North Gujarat. Mr. Vaidya's services have been of very great use to cultivators specially.

A new case tractor 22-40 B. H. P. has been recently purchased for South Gujarat and is being tried on the Surat Farm. On seeing that it successfully works on the Farm and round about, it will be given out on hire to cultivators in the Surat and Broach Districts.

BHIMBHAI M.,
Deputy Director of Agriculture,
Gujarat, Surat.

Surat:
Dated the 3rd August 1924.

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APPENDIX G.

Summary of Work done by the Deputy Director of Agriculture, Konkan, during the year 1923-24.

General.

1. *Charge.*—Mr. V. G. Gokhale was in charge of the Division throughout except the last twenty days of the year when Mr. K. M. Pawar held the charge. This report for the above reason has been prepared by Mr. Gokhale.

2. *Lines of Work.*—The work of the year 1923-24 has proceeded and developed along the same main lines as of the last report without any changes of importance in the detailed organisation and equipment of those main lines.

3. *Staff.*—The strength of the superior technically educated staff of assistants stood in the year as follows, as compared with that of the last year :—

	1922-23	1923-24.
Research and Experiment ...	8	8
Extension and Propaganda ...	5	5
Agricultural Education ...	2	1
In training ...	Nil	1

The Agricultural School at Veshwi having been closed, the post of the Head Master of that school was reduced.

4. *Cost of the Year's Work.*—The following statement will furnish the information in abstract and in comparison with the previous year for each broad division of activities :—

Class of Work.	Establishment (pay and allowances).		Contingencies.		Total.	
	1923-24.	1922-23.	1923-24.	1922-23.	1923-24.	1922-23.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Research and Experiment ...	15,693	18,317	16,533	17,982	32,226	36,299
Extension and Propaganda...	18,845	16,161	6,229	4,825	25,074	20,986
Agricultural Education ...	4,536	5,294	8,300	10,027	12,836	15,321
Direction and Superintendence.	14,741	17,310	1,793	1,796	16,534	19,106
Total ...	53,815	57,082	32,855	34,630	86,670	91,712

It will be seen that the expenditure has been reduced down under almost all the headings except those of agricultural propaganda, the total expenditure amounting to about six per cent. less

than that of the last year. The increased expenditure under Agricultural propaganda is due to leave charges, to one graduate being additionally entertained for training and to the expansion of propaganda activities which may be regarded as in the right direction.

5. *Physical and other Conditions influencing the Agriculture of the year.*—The rainfall and the season on the whole was not favourable. The peculiarity of this year's rainfall was that nearly three-fourth of the annual precipitation was received in July, while June and August got few showers. The conditions which affected the yield of rice, the important crop of Konkan, were the holding off of rain in the seedling stage heavy showers in July resulting in lodging the crop in low-lying fields, very light showers in August and suspension of rain in September. On the whole the net effect of the season was decrease in the yield of rice by 10 to 25 per cent. Rabi crops could not be grown for want of sufficient moisture. There was sufficient water for irrigated crops in streams and wells, but in upghat Talukas of the Kanara District and other parts of Konkan near the hills supply of water was less.

With regard to pests and diseases, those worth a special mention, as occurring in addition to the usual ones are a mild attack of rice stem borer in Ratnagiri, attack of mango hoppers in Ratnagiri and Kolaba and a very severe attack and loss by Koleroga on betelnut in Kanara amounting to 40 per cent. and more. Trouble from wild pigs is on the increase in Kolaba and parts of Ratnagiri District near jungles. In the upghat Taluka of the Kanara District, namely, Sirsi and Yellapur, the elephant trouble is on an increase and is threatening to be serious on that side.

6. *Results of the Year.*—These are summarised below under the headings of the main lines.

Research and Experiment.

7. *Researches into the Increasing of Yield or bringing about an Economy in Rice Cultivation.*—The physiological factors which contribute towards making up the yield, and the best and the most economic ways to influence their action have been under an intensive and exhaustive study at the Karjat Rice Research Station for the last five years Out of the rice experimental work at Kumta and Ratnagiri, representative of quite different sets of conditions of soil and climate, which was remodelled since 1922 to conform to the general policy adopted for the main station at Karjat, that at Kumta was continued but owing to diversion of the investigating staff at Ratnagiri to more important work, the latter ceased to serve as a supplementary centre.

The programme of the year's work aimed at verifying the yet inconclusive results of the past period and at exploring deeper into the requirements of the rice plant in respect of proper nourishment and water. The verifying part of the work has confirmed the findings of the past work so as to need no further repetition. The

further exploring part has brought us to a new line of attack of how the size of the ear-head can be increased without reducing the optimum number of bearing plants per acre. Next year's work has been so planned as to throw light on this issue. Experiments were also designed to study the water requirements of rice and the methods of approaching the subject have been cleared up. At Kumta the inaction of manures in absence of humus and comparatively higher proportions of straw to grain in contrast with those at Karjat have assumed special importance. The study of some side issues have led to the following results of practical value :—

In advocating nitrogenous manures such as sulphate of ammonia on trap soils represented by Karjat, no change seems to be necessary in spacing that is generally adopted by cultivators without manure, but some economy in the quantity of seedlings may be brought about by reducing the number of seedlings transplanted per bunch by half.

Artificial manures such as sulphate of ammonia, mineral superphosphate and sulphate of potash do not leave any residue even in the first year of their discontinuance.

A Committee consisting of the Director of Agriculture, Deputy Directer of Agriculture, Konkan, the Agricultural Chemist, the Economic Botanist, the Rice Specialist and Mr. K. V. Joshi, the late Rice Specialist, has been constituted to direct the policy of the future work.

8. *Selection and Breeding of Higher Yielding Strains of Rice for South Konkan.*—It has been stated in the last year's report that being encouraged by the success achieved in evolving substantially higher yielding strains of *kolamba* rice for the North Konkan at the Karjat Rice Breeding Station, breeding work for South Konkan was to be taken up at Ratnagiri on the existing Ratnagiri Farm since the year under report.

A Committee consisting of the Director of Agriculture, the Plant Breeding Expert, the Deputy Director of Agriculture, Konkan, the Economic Botanist and the Breeder in immediate charge of the work has been constituted to advice and control the general policy of the work.

The work of the year, therefore, consisted of the first stage of plant breeding work, *viz.*, collecting and growing under comparable conditions bulk seed samples representative of the commoner varieties grown at present on fairly considerable scale in the area to be served. In all 234 such bulk samples were collected and grown. From the crop of these samples 913 individual plants, indicating by their characters, to be observed on growing plants, the possibility of giving high yield, were selected, harvested and their yields weighed separately. Judging further from the actual yields, 200 individuals, showing the highest yields amongst the samples representative of different conditions, have been taken out for further testing. Only 40 of the latter under the late group are to be dealt

with on the plant to plant basis and the remaining are to be observed on the collective performance of each of them separately to see if they contain any material worth further working up.

Judging on the basis of the performance of the various bulk samples tested, some samples, giving higher yields than the local by from 3 to 172 per cent., have been obtained and it is mostly from these lots that our material for future work has been taken.

9. *Remedial Measures against Rice Land Crabs.*—The land crab is responsible for a very great direct and indirect damage in the North Konkan and also in Sind, and the study of the pest and remedial measures against it has been taken up since the year 1922, as requiring the first attention amongst several zoological problems of the Konkan. During the year under report, three more species of land crabs have been found and identified and their distribution has been further studied in new tracts; two cases of mating were noticed and some evidence was observed to show that crabs might be producing young ones more than once in their life-time; out of a net work of openings of hibernating burrows, most of them are superficial. Some data have been obtained in the laboratory regarding the rate of growth and the number of moults cast by the different species, and it is adjudged that the *Gecarcinucus* species might be living up to 4 to 5 years while the *Paratelphusa* might be living only up to 2 or 3 years. One very important weak point has been discovered in its life history which is likely to be of great value in controlling the pest, and that is a temperature above 100° F is quite fetal, death taking place within 2 or 3 minutes at 110° F.

The investigation of remedial measures was continued. Baiting into them earthen pots was not successful to any practicable extent; amongst the several baits and attractive smells and poisons tried, boiled rice, grass hoppers and Paris Green proved to be the most effective respectively. Fresh air-slaked lime and washing soda were also found useful, but washing soda is out of the question as it is harmful to plant growth. The fumes of a number of substances were tried, out of which carbon-bi-sulphide, methylated spirit, petrol were found very successful. Carbon-bi-sulphide being given a field trial gave the best results. A small quantity of naptheline to petrol or spirit accelerates their action. All these are yet to be tried on a business scale.

10. *Selection and Breeding of higher yielding Strains of Nagli (eleusine coracana).*—This work is being done at Hatkhamba, 10 miles east of Ratnagiri. The year of report is the third of taking up this work. The fifteen strains which were isolated out of a large number of single lines tested in the previous year were further studied in an intensive manner. These showed an increase up to 50 per cent. in this year's comparisons with the locals, whereas they were also selected last year because these had given 100 per cent. or more yield. On the whole the absolute outturns of strains have remained more or less the same as last year, but those of the checks

have increased considerably. It appears this behaviour of the checks in the two years might be due to the fact that the local checks used during the two years have not been the same, last the seed samples used for checks were obtained from a single cultivator, whereas in the report year the sample was made up from 20 lots of one and the same variety obtained from several cultivators, the idea in doing the latter being to make the sample as average and representative as possible. These strains, nevertheless, have kept their high ranks on the whole as compared to some more continued as reserves. Six out of the fifteen, not having given good yields this year, nor being consistent in replicates and being also those from the lower ranks of the last year, are not worth continuing. All the rest will be continued for further verification. Also out of the reserve lot of 71 individuals, two have shown fairly high yields and one has a special characteristic, so these will be added to the strains for intensive study.

Some evidence has been noticed whereby natural cross-fertilization is suspected to a small extent—say from 1 to 2 per cent. Thus the strains under intensive study must be thoroughly tested about their undoubted purity before they could be finally decided as fit for recommendation. The two of the best of these can be tested on a field scale. The reserve lot with the exception of some which are definitely poor will also be continued.

11. *Remedies against Blight Disease of Onions.*—This is the third year of the investigation of this disease and into remedial measures in collaboration with the Plant Pathologist to Government. The year's results on the Kumta Farm confirm those of the previous years that the addition of one or more elements of plant food in artificial forms or spraying with Bordeaux mixture do not appreciably change the incidence of disease. The post of the Plant Pathologist being in abeyance further study has also to be suspended.

12. *Bone Meal as a corrective of salt affected sweet Rice Lands in Kanara.*—This experiment was repeated on cultivators' fields for verifying the first year's results. These have fully and conclusively corroborated the first year's remarkable results which are now ready for demonstration. The results have been sent up for publication in the Agricultural College Magazine.

13. *Testing of the Use of concentrated Manures and new Varieties of Sugarcane in Kanara.*—It has been found essential to have farm yard manure in the land from the beginning of the sugarcane crop on soils represented by the Kumta Farm. Mere artificials like sulphate of ammonia are not effective. Contrary to expectations even a small dose of 200 lbs. of bone meal has been found beneficial to sugarcane in laterite parts of Konkan. This is a very valuable result.

On the Kumta Farm it has been found that increasing the distance between the rows of sugarcane to more than 2½ feet results in a reduction in the yield per acre.

In the matter of varieties, Red Sport and Manjav may be finally put down as ones competing fairly well with Red Mauritius with advantages of earliness and richer and purer juice and the disadvantage of softness of the former. Two promising strains Nos. H. M. 544 and 312 evolved by selection out of Red Mauritius by the Mysore Department of Agriculture and reported to be superior to Red Mauritius in their tracts similar to upghat Kanara parts have been taken for trial on cultivators' fields. The crops obtained are yet on too small a scale to judge about their profitableness or otherwise. Similarly new varieties are under trial on cultivators' fields in the Mundgod (eastern) tract of Kanara, which has much less rainfall but some supply of tank irrigation.

14. *Sulphate of Ammonia for Melons.*—The profit of using sulphate of ammonia for melons as compared with fish manure, which is the local manure used in the Kolaba District, was confirmed in this year's trials on ordinary rice and alluvial lands, but the results were not as good on heavier description (or Manat) of soils.

15. *Experiments in increasing the Yields and Profits from Cocoanuts in Konkan.*—Some manurial treatments which have been recommended by other cocoanut investigators were begun to be tested in cultivators' gardens in Kanara. This being the first year of the trial no results are observable. One dwarf and reputed variety from Malay States and another dwarf and green variety from Cochin which are reported to be good yielders are being compared with the local ones. A general study of the cocoanut plant is also taken up; no difference was noticed in the germination of the top and bottom nuts of a bunch; although seed nuts planted vertically germinate a little later than those planted horizontally or inclined half way, eventually the growth gets equalised. The suitability of *crotolaria striata* and *tephrosia candida* as green manuring plants in cocoanut gardens has been conclusively proved by this year's results.

16. *Bourbon Tree Cotton on Varkas Lands in Ratnagiri.*—The experimental plantation started in the previous year which was reduced to sticks at the end of the fair season revived again after the setting in of the monsoon of the year under report, and made a fair growth up to the end of that monsoon; but the plants began to wither and drop their leaves again in the fair season without producing any bolls. A plantation started on deeper soils on the Ratnagiri Farm is, however, growing well and produced bolls. It is, therefore, clear from this that whereas this tree cotton would succeed well on deep but well-drained high lands, it has no prospects of success on shallower rocky slopes of hills.

17. *Wheat in the North Konkan.*—This year's trials confirm the results of the past two years that Pusa 4 can be grown fairly successfully as it is not susceptible to rust.

18. *Safflower as a Rabi Crop in Moisture retentive Rice Lands.*—The stray cattle is a great hardship for the cultivation of Rabi crops in moisture retentive rice fields as fencing isolated patches costs a

good deal. With the idea of seeing whether safflower could grow successfully and by its spiny nature would give a crop unmolested by stray cattle, this was tried in fenced fields first to see how it grows with very hopeful results.

18A. *Tobacco in coastal parts of Kanara.*—This crop was tried a third time on the Kumta Farm and on cultivators' fields. The results can now be said to be conclusive that this crop bids fair to be a decided success and a profitable crop to grow. It is believed and also experienced to a certain degree that it requires to be watered overhead so that the sticky substance secreted on leaves is washed away and the cured tobacco would not be bitter in taste.

19. *Algaroba (Prosopis juliflora).*—The few plants which are established on the Ratnagiri and Kumta Farms continue to live and those on the Ratnagiri Farm which have received irrigation and are on deep soil have grown vigorously wild big plants. Those without irrigation on varkas lands are just keeping up.

20. *New Fruit Trees.*—On the Kumta Farm oranges and mosambis continue to thrive well giving nearly the same quality of fruit as in Poona.

Alphonso, which is a lasting variety of mango, has been now conclusively proved to be suitable for Kanara conditions. Its plantation is being steadily taken up by cultivators.

At the request of the Ratnagiri Taluka Development Association the Government of Bombay have appointed a committee for enquiring into the present conditions and difficulties of marketting of mangoes and to make recommendations. Guavas and citrons have been found to thrive well in the eastern tract of Kanara.

21. *Improvement in Implements.*—The small Vatandar plough, which is a turn-wrest one, sold by Messrs. Kulkarni and Sons of Dharwar, has been found to suit the eastern tract of Kanara.

The Eureka plough sold by the Mysore Department of Agriculture has been found to be more economic for ploughing the sandy rice fields which are usually hand dug in Kanara.

Disc harrow and sabul plough were tried for over-turning the salt rice lands of the North Konkan. The sabul plough was found to draw heavy for one pair of Konkan bullocks and the tilth produced by the disc harrow was not enough.

A light disc harrow was found on the Kumta Farm to prepare a fine puddle for transplanting rice, but it needs to be still lighter so as to be drawn by an ordinary pair of Konkan bullocks.

22. *Oven Drier for Drying the Garden Produce in Kanara.*—The experimental oven-drier constructed at Killar, taluka Siddapur of the Kanara District, was continued to be tested for drying betelnuts, plantains, &c., with great advantages. The defect of the uneven distribution of heat in the drying chamber referred to in the last

year's report could not be improved upon as the Agricultural Engineer, who was approached for expert advice, was not able to have it visited and examined.

23. *Best Way of utilising Bare Minor Forest Areas for Supply of Leaf Manure.*—This is the third year of the experimental plantation started at Kumta. Out of 23 species so far tried all have been able to survive through the fair season and start growth again during the next rainy season. From the experience of two years *terminalia tomentosa, cassia arboria* have been found to yield the highest quantity of vegetation in a given length of time up to the second year of growth. Out of the species tested all except mango and *dillenia pentagyna* stand pruning very well. *Memecelon edule* and *gardenia gumunfera, calatropis gigantia* and *Kuda* are not broused by cattle. As tested for rice, the green leaves of nux vomica and *terminalia belerica* and dry leaves of *cassia arboria* came to the top.

The trials in establishing plantations of *calatropis gigantia,* which has proved so remarkably beneficial for rice are being done at several places in almost all the Districts of Konkan. The optimum conditions necessary for success have not yet been known. Cuttings planted strike growth very well but the root system is not sufficiently developed to successfully tide over the fair season on shallow rocky hill slopes. On deep soil they have thriven better but it appears that the plant requires a thoroughly porous aearted well-drained soil. The plants grown from seeds sown in *situ* have not been able to survive through the dry season, though some self-sown plants are seen to establish themselves.

24. *Lac Culture.*—Brood lac sticks on *Ziziphus jujube* were obtained from Pusa and have been used for inoculating both *ziziphus* and *butja* trees at Karjat (at the foot of the Western Ghats). The inoculations have been quite successful on both of them and a good deal of lac has been produced by them. It is to be seen whether they will stand the high temperatures in April and May.

Extension Work.

25. Extension work consists in bringing agricultural improvements to the notice and into the practice of agriculturists and giving such advice and help as will make the agricultural industry in general more profitable. This work is principally carried on through the intinerent district staff who are called Agricultural Overseers, assisted by Kamgars. The Agricultural Stations also serve as standing centres of demonstrations or as centres for distributing improved seeds, manures and implements. Government have also desired since 1922 that local bodies, each not extending over an area of one taluka should be stimulated and encouraged for gradually taking over the work of Agricultural and Co-operative propaganda wherever conditions are ripe for the same by according their sanction to a grant of an annual subsidy equal to half their expenditure up to a limit of

Rs. 1,000. Similarly Government have, since April 1922, constituted Divisional Boards of Agricultural and Co-operative propaganda consisting of a majority of non-official representatives of the two movements to generally direct, control and supervise the working of the propaganda activities of the two movements either through Government Departments or the Local Bodies referred to above.

26. *The Work of the Konkan Divisional Board during the year.*—The Deputy Director of Agriculture, Konkan, continued to be the Chairman of the Board throughout the year according to the constitution. All the quarterly meetings were regularly convened and attended with quorum. The non-official members appointed on the Board for the year 1924-25 are as follows :—

1.	Mr. K. T. Karulker, Umbergaon, District Thana.	Representatives of Agricultural movement.
2.	Mr. V. V. Nilekani, Sirsi, District N. Kanara.	
3.	Mr. V. K. Sanjanwala, Umbergaon, District Thana.	Representatives of the Co-operative movement.
4.	Mr. V. V. Athalye, Shiposhi, District Ratnagiri.	

The non-official members with the exception of only one took a keen interest in the work of the Board and contributed many valuable suggestions. In addition to the administrative work of exercising general control and supervision of the Agricultural and general propaganda through the Government Departments and Taluka Development Associations, the Board considered and passed during the year 15 resolutions calculated to improve the policy of the propaganda, but 9 could meet with the approval of the Joint Board of the Director of Agriculture and the Registrar, Co-operative Societies, Poona.

27. (*a*) *Through direct Agency of the Agricultural Department.*—The work was carried on unhindered by any circumstances such as absence of staff and the like. The detailed items of improvements proved to be worth introducing, which have formed the activities of the year are given below by each district, the sphere of operations which it has been possible to tackle being indicated in brackets against each district. The items shown in italics represent the major ones.

Thana District.—(Chiefly round Palghar and in Kalyan Taluka).

(1) *Improved Strain of Kolamba Rice,* (2) *Nitrate of Soda for Onions,* (3) *Silage.*

Kolaba District.—(Chiefly Ulhas and Patalganga valleys and Andhra valley).

(1) Stimulation of irrigation farming on the tail waters of the Tata Hydro-Electric Works, together with all improvements possible; (2) *Substitutes to meet the deficiency of Rab for rice;* (3) Meston plough, (4) *Improved Kolamba Strains of rice;* (5) Bone meal manure for rice; (6) Nitrate of soda for onions; (7) Blade harrow for puddling, (8) Bulsar Rahat, (9) Leg horn breed of poultry.

Ratnagiri District.—(Chiefly Ratnagiri, Sangameshwar and Devgad talukas).

(1) Bone meal, fish manure and sulphate of ammonia for rice; (2) *Mass selection of rice seed;* (3) *Deccan harrow for puddling rice fields;* (4) New profitable crops of sweet potato and *kharif* chillies on *varkas* lands; (5) Guinea grass on varkas lands; (6) New and profitable crop of onion; (7) Extension of sugarcane cultivation; (8) Poisoning of wild animals doing damage to crops; (9) Meston plough; (10) Sabul plough; (11) Hand weeding tools; (12) Mote; (13) Spraying against mango hoppers; (14) Improved breeds of poultry; (15) Silage; (16) Surti Buffalo bull at Ratnagiri.

Kanara District.—(All over the district).

(1) Mass selection of rice seed; (2) *Bone meal manure for rice;* (3) Fish and ammonium sulphate in seed bed for rice; (4) Sulphate of ammonia for paddy in east Kanara; (5) Mascaty variety of rice; (6) Planting fewer seedlings; (7) Half seed rate; (8) *Red Mauritius and other higher yielding varieties of sugarcane;* (9) *Use of concentrated manures such as sulphate of ammonia, fish manure and undi cake for sugarcane;* (10) Wider planting and more efficient and economic tillage by sabul plough; (11) *Improved mills, furnaces and pans;* (12) Groundnut on makki and *hakkal* lands; (13) Vari on hakkal and kumeri lands; (14) *Onion cultivation together with top dressing with concentrates;* (14) Tobacco cultivation; (15) Improved rice land puddler; (16) *Spraying against koleroga of betelnut;* (17) Pig proof wire fence, *poisoning of wild animals,* and organisation of communal watching for the protection of crops from wild animals; (18) Extension of grafted mangoes; (19) *Silage in East Kanara;* (20) Introduction of new and more profitable irrigated and *hakkal* land crops in East Kanara; (21) Surti Buffalo bull at Kumta.

Well Boring.—All districts.

General Propaganda.—While carrying on propaganda in connection with specific improvements detailed above, dissemination of general knowledge of improved methods of agriculture, giving advice answering querries are also done by means of literature talks and discourses and magic lantern shows.

For the purpose of bringing the various improvements specified above to the notice and into the practice of cultivators demonstration

plots on cultivators' fields numbered as follows in comparison with those of the last year :—

Year.	Thana.	Kolaba.	Ratnagiri.	Kanara.	Total.
1923-24 ...	Not reported.	18	32	106	156
1922-23 ...	...	23	19	74	116

The year has added its quota to the progress under the various items with more or less rapidity as they fit in with the economic and temperamental conditions of the people to a more or less degree. spraying against *Koleroga* (mildew) disease of betelnut in Kanara has been received with an enthusiastic response ; similarly the introduction of the higher yielding strains Nos. 42 and 79 of Kolamba rice on a large scale for the first time in the Karjat Taluka of the Kolaba District having fully confirmed the expectations arrived at from the results at the Breeding Station, the distribution operations have been extended to cover an area of about 10,000 acres in four or five talukas of the Thana and Kolaba Districts.

The following items of improvements have been now sufficiently popularised so that no further propaganda is necessary in them :—

Kanara District.—Improved sugarcane mills, Concentrated manures for sugarcane, Groundnut.

It has been also conclusively proved that the following items do not at all fit in with the Agricultural economic and temperamental conditions of the people and there is no need to go on further with them :—

Thana District.—Mass selection of seed (rice).

Kolaba District.—Bone meal for rice.

Kanara District.—Kirlosker's land side plough for Eastern Kanara.

The experimental work has also conclusively proved during the year the suitability of the following new items of improvements which will be included in the programme of propaganda work from the next year :—

Thana District.—Manuring of plantains with a mixture of superphosphate and nitrate of soda. Introduction of leg horn breed of poultry.

Kolaba District.—Introduction of leg horn breed of poultry.

Ratnagiri District.—Hand weeding tools.

Kanara District.—Popularisation of grafted varieties of mangoes. Green manure crops in cocoanut gardens, Guinea grass as a fodder crop in gardens.

28. *Arrangements to supply Implements, Manures, Seeds and other Articles.*—In order to meet the demands which are created as a result of the propaganda work for articles which are not an ordinary market commodity, the organisation for sale and hire depots and free agency work for arranging supply of others direct from the firms were continued. Bone meal manure, sulphate of ammonia, Meston plough, Poona gul boiling pans and sugar cane mills, pig proof wire fence, farm dynamites for making pits for mango planting and mango grafts were the most important of the articles thus dealt with. Arrangements to supply denaturalised salt for manurial puposes duty free were continued. Government have fixed a rate of annas thirteen per Bengal maund for three years up to 1925-26 even though it may cause some loss in the transaction. The number of permits issued together with the total quantity of salt for each district during the year under report is given and compared with that of the last year in the following statement :—

Period.	Thana District.		Kolaba District.		Ratnagiri District.		Kanara District.	
	No. of permits.	Quantity issued.	No. of permits.	Quantity issued.	No. of permits.	Quantity issued.	No. of permits.	Quantity issued.
		Bengal Mds.		Bengal Mds.		Bengal Mds.		Bengal Mds.
November issue ...	7	85	Nil.	Nil.	32	725	47	285
April-May issue ...	21	2,676	10	158	70	1,424	60	543
Total for the year 1923-24.	28	2,761	10	158	102	2,149	107	828
Total for the year 1922-23.	7	180	2	40	51	1,128½	43	398

29. *Well boring for Cultivators.*—The organisation for well boring for cultivators has been transferred to the control of the territorial Deputy Director from the 1st of February 1923. There has been no alteration during the year in the number of Musto Patent Hand Machine and one Calyx power drill which were available at the end of the last year. Three of the hand and one power machines were allotted to the Thana District where there has been the greatest success and demand for well boring, while one hand machine has been allotted to each of the remaining three

districts in which boring is yet in an exploratory stage. The following is a resume of the work done from 1st July to 30th June of the year :—

District.	Number of machines.	Number of enquiries received during the year.	Number of enquiries which resulted into definite orders supported by agreements.	Number of definite orders which cannot be provided for up to the end of the next year for insufficiency of machines.	Total footage bored.	Number of bores completed.		Number of bores incomplete.	Number of bores cleaned.	Putting up hand pumps.	Repairs to engines and power pumps.
						Successful.	Unsuccessful.				
Thana ...	4	64	36	28	1,535′	19	7	4	5	22	1
Kolaba ...	1	16	6	10	291′	2	2	1	...	...	...
Ratnagiri ...	1	15	6	9	80′	...	2	1	...	...	...
Kanara ...	1	6	3	3	139′	1	2	...	...	...	...
Total ...	7	101	51	50	2,045′	22	13	6	5	22	1

During the year under report 1,535 feet were bored in the Thana District with 19 successful bores, the highest depth for the successful bores being 107 feet. From this year's results it may be said that there are possibilities of water being tapped in the Kolaba District as will be seen from the above statement. The boring work in the Ratnagiri District is still under trial and nothing definite can be said just now but it is expected that some data will be available next year from which conclusions can be drawn. The Kanara conditions reported last year still hold good.

B. Through Local Non-official Organisations.

30. *Old Type Agricultural Associations.*—There has been no improvement in the general apathy and defunctness of these local organisations excepting the few rare cases in which the local Agricultural and Revenue Officers have made it their task of love. The reasons for this have been explained in full in previous reports and it is time to abandon these as hopeless.

31. *Taluka Development Associations according to the new Government Scheme.*—The origin and special advantages of these local bodies under this name as per scheme sanctioned in Government Resolution No. 3378, dated 5th June 1922, R. D., has been explained in the last year's report and more fully in the Government Resolution itself. Efforts to bring the provisions of the Government scheme to the notice of the public with a view to stimulate, encourage and help local interest and effort to form Taluka Development Associations in areas which are regarded as ripe to take up the work of agricultural improvements on their own shoulders were continued. As a result, Mahim and Kalyan Talukas of the Thana District, Karwar Taluka of the Kanara District and

Rajapur Taluka of the Ratnagiri applied to and were recommended by the Divisional Board for recognition. All of them applied to get themselves registered under the Co-operative Act, but no intimation has yet been received about Rajapur and Kalyan which were sent up late in the year. The application of the Murbad Taluka of the Thana District is still under enquiry of the Divisional Board while Malvan has applied to the Deputy Director of Agriculture, Konkan, for making the preliminary Agricultural survey for them.

Thus including those formed in the past, the following talukas in each District have Development Associations at the end of the year under report:—

Thana:—Mahim and Kalyan.

Kolaba:—Alibag

Ratnagiri:—Ratnagiri, Dapoli and Rajapur.

Kanara:—Karwar and Sirsi.

All of them have been advised in drawing up their annual programmes and budgets and have appointed Kamgars for carrying on their propaganda work. Technical advice and guidance was frequnetly given to the Managing Committee in the conduct of the work and in directing and supervising the work of their Kamgars. All the Associations are yet in their infancy and require considerable guidance in technical matters by the officers of the Agricultural Department before they will be able to take from their Kamgars systematic and effective work. The Sirsi Kamgar being particularly good, the work of that Association has been much better organised and effective than others. Alibag has been the worst in this respect. It has been the general experience that the *management find it extremely difficult to command sufficient confidence of the people to put together their local quota of contributions annually.* Some associations have, therefore, under their consideration schemes of collecting together a permanent fund. All Associations have adopted a bye-law to have the Mamlatdar of the taluka as the Vice-President and wherever the Mamltdars have taken active interest, results have been better than where they are apathetic. The keen and active interest taken by Mr. K. R. Situt of Rajapur Taluka must be specially mentioned. Messrs. G. K. Gokhale, while Mamlatdar of Sirsi and V. B. Kale of Alibag have also distinguished themselves from others in this respect.

Annual reports have been received from all, except Alibag. They show varying quality and quantity of work but which can be generally said to be much short of what could be expected.

Government subsidies as mentioned below were paid by the Director of Agriculture on the recommendation of the Konkan Divisional Board:—

Mahim Rs. 600, Alibag Rs. 800, Ratnagiri Rs. 1,000, Dapoli Rs. 521, Sirsi Rs. 500, and Karwar Rs. 600.

32. *Stimulation of Co-operation for promoting Agricultural Improvements.*—The Agricultural propaganda staff are side by side with individual persuasion, also on the look out for stimulating co-operative effort for promoting agricultural improvements. Several possibilities of fencing, implement hire, irrigation and sale societies have been located and investigation and stimulation were carried on during the year with the following results :—

Implement Hire Societies at Mundgod	... 1
Sale Societies—Mango Sale Society at Ratnagiri	... 1

A special paid officer for stimulating, investigating and supervising agricultural co-operation for the districts of Thana, Kolaba and Ratnagiri has been transferred since the year 1923 to the control of the Agricultural Department under the Divisional Deputy Director of Agriculture. The Agricultural Organizer before directing his attention to the stimulation of new societies had first to see to the consolidation, improvement, expansion of the existing Non-credit Agricultural Societies and Taluka Development Co-operative Associations, to taking steps to bring about the recovery of overdues. Most of the Manure and Cattle Breeding Societies have degenerated very much and have allowed overdues to accumulate and had to be visited many times. Some of them have been stimuleted to life and arrears have been recovered from some others but they can by no means be yet left to themselves. In addition to the above in all 5 irrigation, 2 fencing, 2 manure, 1 dairy and 1 Taluka Development Co-operative Association possibilities were in hand for investigation but the following only have so far reached the stage of materialisation :—

Sale Societies—Dried Plantain at Agashi	... 1
Dairy Societies—At Kalyan	... 1
Taluka Development Association—At Murbad	... 1

Liquidation work of three societies was entrusted and attended by him. The incumbents of the post being quite new they had to get themselves trained in the work.

Proposals for Non-credit Agricultural Co-operative Societies from the District Honorary Organisers for Co-operative Societies were sent up for the opinion of the Deputy Director of Agriculture.

The greatest need for the development of proper schemes of agricultural co-operation is the availablity of long term loans at a low rate of interest.

C. Through Publications.

33. Leaflets in English as well as vernaculars for free distribution containing new successful results of the Konkan Division to be recommended, drawn up during the year are as follows:—

1. Higher yielding strains of Kolamba Rice for North Konkan.

2. Red Mauritius variety of sugarcane for Konkan (Particularly Kanara).

Notes and articles were contributed to the various Agricultural Magazines by the members of the staff of which there were (20) extracts, abstracts, &c. and (32) original ones being mentioned below:—

Subject of note or article.	Name of author.	Where published.
1. Sugarcane borer and its control.	P. V. Wagle, Entomological Assistant, Konkan.	Konkan Sheti Samachar.
2. Cultivation and uses of cashewnut.	Do. ...	Do.
3. Varkas crops ...	V. L. Bhoseker, Varkas Land Specialist, Hatkhamba.	Do.
4. Varkas cultivation ...	Do. ...	Do.
5. Flowering and fertilization of Nagli.	S. K. Patwardhan, Agricultural Investigator, Hatkhamba.	Do.
6. Possible lines of increasing the yield of rice in Konkan.	D. M. Kulkarni, Scientific Assistant, Rice Research Station, Karjat.	Do.
7. Turmeric cultivation ...	Do. ...	Do.
8. Chemical and Physical analysis of rice soils in relation to their fertility.	Do. ...	Agricultural College Magazine, Poona.
9. Ginger cultivation ...	K. V. Joshi, Rice Specialist, Karjat.	Konkan Sheti Samachar.
10. Cottage industries ...	M. V. Gadkari, Scientific Assistant, Rice Research Station, Karjat.	Do.
11. Information about laterite stone in Goa.	Do. ...	Do.
12. Lemon budding ...	Do. ...	Do.
13. Method of sending grafts and plants by post.	Do. ...	Do.
14. Agriculture and agriculturist.	Do. ...	Do.
15. Cultivation of cane in Mundgod Peta.	G. B. Pandit, Agricultural Demonstrator, Mundgod.	Do.
16. Importance of salt to food.	Do. ...	Do.
17. Comparison of city life and village life.	Do. ...	Do.

Subject of note or article.	Name of author.	Where published.
18. Review of Konkan Sheti for 1922-23.	G. B. Pandit, Agricultural Demonstrator, Mundgod.	Konkan Sheti Samachar.
19. Experience of ensilage making 1922-23.	Do. ...	Do.
20. Papai as a fruit ...	Do. ...	Do.
21. Lemon as a fruit ...	Do. ...	Do.
22. Six monthly report of Mundgod Demonstration Farm.	N. J. Gokhale, Kamgar, Mundgod.	Vakkaligaroo Vakkalitanavoo
23. Cottage industry ...	Do. ...	Do.
24. Suggestions for training boys in agricultural schools.	Do. ...	Do.
25. Demonstration at Andebail.	Do. ...	Do.
26. Note on Koleroga ...	M. R. Gokarn, Agricultural Overseer, Kanara.	Vakkaligaroo Vakkalitanavoo and Konkan Sheti Samachar.
27. Myndoli variety of plantains in Goa.	M. R. Gokarn, Agricultural Overseer, Kanara.	Agricultural College Magazine, Poona.
28. A note on staking of sugarcane by wire.	V. S. Habbu, Superintendent, Kumta Farm, Kumta.	Do.
29. Report of demonstration held at Panwel.	N. V. Hanmante, Agricultural Overseer, Kolaba, Karjat.	Konkan Sheti Samachar.
30. Artificial manures and objection of the public on them.	Do. ...	Do.
31. Some useful hints about cocoanut.	Do. ...	Do.
32. Importance of fruit and vegetables.	Do. ...	Do.

34. *The Konkan Agricultural Magazine.*—The monthly magazine in Marathi devoted exclusively to Konkan agriculture under the name *Konkan Sheti Samachar* commenced by Mr. Y. G. Gurjar of Alibag in the year 1917 and the editing of which was taken over by the Konkan Agricultural Department was regular in publication under the editorship of Mr. G. B. Pandit, L.Ag., Agricultural Demonstrator, Mundgod, District Kanara, for which he and others who contributed and Mr. Limaye who published the same punctually deserve the best thanks. Its circulation at present stands at 535 copies which is more by 14 copies as compared to the last year.

Agricultural Education.

35. *The Agricultural Middle School in Vernacular.*—The year under report is the seventh year of the Agricultural School at Jambul near Kalyan, District Thana, for giving agricultural education of a primary nature through Marathi primarily for the Marathi speaking Konkan Districts. There has been no change during the year in regard to the standard for admission and the course of studies.

The year opened with 17 students, 14 in the first year and 3 in the second year. At the end of the year, however, there remained only 11 students in the first year and 3 in the second year. Out of these only 1 in the senior class and 5 in the junior class passed in the examination. Whatever students could be secured for the school have not done so well.

The total expenditure of the school including the teaching staff and free boarding expenses amounted to Rs. 12,792-9-0 and the total receipts to Rs. 1,308-6-0 as against Rs. 13,017 and Rs. 3,830 respectively of the previous year.

Out of 47 boys turned out successful from this school up to now, 1 having just passed out and 10 of the previous batch have not yet settled in life, 9 are managing their lands, 7 are in service connected with agriculture, 4 continuing ordinary secondary education, 13 are engaged in business other than that of agriculture and whereabouts of 3 are not traceable. Those that are engaged in farming have not as yet exhibited any striking development to justify their education at this school.

In spite of the several measures resorted to for recruiting as detailed in the previous reports there has not been any improvement in the apathetic attitude of the people towards this form of agricultural education. It is, therefore, thought that unless some definite inducements such as preference in selecting candidates for *talathis* and rural school masters is offered in the beginning the response is not likely to be much better. Proposals to this effect were sent to Government but they did not meet with their approval. The Head Master undertook a special propaganda tour for explaining the manner and matter of teaching and all the arrangements for the lodging and boarding of students. He obtained about 30 applications from the parts of Thana and Kolaba Districts but eventually only 2 of the 30 applicants actually joined.

36. *Agricultural Bias Classes in the Rural Primary Schools.*—Four teachers one from each of the four districts of Konkan Division selected by the Educational Inspector and the Deputy Director of Agriculture, of the Division were trained in agriculture for one school year. Four primary schools, also one in each district, have been selected in which classes will be opened with the help of these trained teachers. Four more teachers have been selected for training during the school year commenced from 1st June 1924, for opening classes in additional primary schools next year.

37. *Training of Kamgars for meeting the Demand from private Farms or for carrying on Agricultural Propaganda of Taluka Development Associations.*—Two men were trained during the year for this purpose and employed by the Taluka Development Associations.

Crop Tests.

38. In accordance with Government orders contained in G. R. No. 601 of 21st January 1914, R. D., the graduate staff took during the year crop tests as follows :—

Name of crop.	Thana.	Kolaba.	Ratnagiri.	Kanara.
Rice ...	...	4	2	2
Sugarcane ...	...	...	...	1
Nagli ...	...	...	1	...

Personal.

39. The year is characterised by many changes in the personnel of the superior responsible staff of graduates as many as half the number of posts having changed incumbents. All, with a solitary exception, have continued to work faithfully and hard, to the best of their respective abilities and capacities. The name of Mr. N. V. Hanmante, B.Ag., is to be added this year to the list of special mention made in the past.

V. G. GOKHALE,
Offg. Professor of Agriculture,
College of Agriculture, Poona.

K. M. PAWAR,
Offg. Deputy Director of Agriculture,
Konkan Division.

APPENDIX H.

The Department of Agriculture in Sind
Annual Report, 1923-24.

Introductory.

I write this report under rather unusual circumstances as I took charge of the work in Sind at the end of January 1924, with no previous experience of Sind Agriculture, and am now on the point of retiring from the Department. I have studied past records of the Department's work and the current work on the Farms, and I take this opportunity of writing a review rather than a report, and of expressing my opinions, for what they may be worth, after such brief experience, regarding the work, its organisation and its future.

Organisation and Finance.

2. The Deputy Director of Agriculture controls Experimental Farms, each in charge of a Superintendent, at Mirpurkhas, Larkana, Jacobabad and Sukkur, a Seed Farm at Mirpurkhas and a cotton estate for seed production at Chellaro, about 14 miles from Mirpurkhas. Except at the last, each Superintendent has one or more Assistants, and the Superintendent of the Sukkur Farm supervises a small sub-station for trial of wheat varieties at Shikarpur. The Superintendent, Mirpurkhas Farm, manages a Central Agricultural Depot, which is a Store for Seed and Implements for sale, and also contains the Mechanical Assistant's workshop. A Cotton Breeder is also directly subordinate to the Deputy Director of Agriculture. His designation is a misnomer, as his duties include wheat and rice breeding. His headquarters are at Mirpurkhas and he has Assistants there and at Larkana. His work is diffused over four Experiment Stations. A Divisional Superintendent is responsible to the Deputy Director of Agriculture for Propaganda in East Sind, and also controls a small sub-station at Jamesabad for demonstration of cotton varieties and implements. Demonstration work in Middle Sind, comprising Talukas, Hyderabad, Halla, Shahdadpur and Tando Allahyar, and in North Sind comprising Talukas Sukkur, Ghotki, Kambar and Larkana is under the control of the Assistant Registrar, Co-operative Societies in Sind, with officers of the Agricultural Department working under him. A Mechanical Assistant with Headquarters at Mirpurkhas inspects Farm machinery, and controls boring and implement repairing, and is a consultant.

The Divisional Board of Agriculture met three times to discuss propaganda work.

3. The sanctioned strength of the Agricultural Department in Sind is :—

One Imperial Officer,

Two Provincial Gazetted Officers,

Twelve Graduate Fieldmen,
Eighteen Non-graduate Fieldmen,
Seven Clerks,
Five Kamgars,
Three Mechanical Establishment, and
Three Engine Drivers.

Three Graduate posts are vacant.

4. The cost for 1923-24 was :—

Salaries including T. A.	...	Rs.	92,157	0	0
Contingencies	...	,,	77,141	12	4
Total	...	,,	1,69,298	12	4

and the receipts credited to the Treasury were Rs. 60,116-10-2.

Farms.

5. The Mirpurkhas Farm is 60 acres in area, of which 8 acres are devoted to fruit gardening, 12 acres 24 gunthas to buildings, roads and drains, and the remainder to cotton and wheat breeding and testing, trial of rotations, and fodder growing. 23 acres were under Kharif, 8½ under Rabi and 8¼ fallow. The Farm possesses 9 bullocks valued on 1st April 1924 at Rs. 690, and dead stock of value of Rs. 4,223. It spent Rs. 5,975, on contingencies, and sold Rs. 6,506 worth of produce of which the garden accounted for Rs. 3,844. The Farm has two wells, and there is a third in the bungalow compound. A large pukka well is an urgent need for the fruit culture, and a second would be advisable. Cotton on the Farm did very well; it was sown in good time and yielded two good pickings, one on the 20th October and the other on the 20th of November. Mr. Umershah, the Superintendent, is of opinion that it would have yielded two more fair pickings, without watering after October, if frost had not come. The area under berseem was very small, and the poor Rabi supply of water rendered this and the wheat crop very poor indeed.

6. The most striking impression the experimental agriculturist receives on his first visit to Mirpurkhas Farm—and this impression is emphasised everywhere he travels in Sind is the extraordinary difficulty of carrying out field comparisons of crops and treatments. Ordinarily he chooses an area of land which when treated all alike produces an even crop. He knows from experience that though to the eye his crop appears even, the measurement of the yield of a single portion of it is liable to a large error when used as an index of the yield of the whole. When comparing two varieties, or two treatments, he multiplies his plots under each to a number calculated to reduce probale error to a negligible amount with reference to the differences in yield he desires to measure. Heritable capacity to

yield is a difficult enough quality to estimate under the most favourable conditions, and in Sind, where one cannot start with an area judged by the eye to be uniform, the difficulty is enormously increased. I think that this question needs very close study by a man who understands the mathematics of probability, before we can use the field in Sind properly as an out-door laboratory for fine research on the plant's capacity to yield.

7. The Seed Farm was cropped with Punjab American F 4 cotton on 24 acres, Punjab American 285 F on 16 acres, 27 W. N. cotton on 34½ acres, and 30 W. N. on 4 acres. These cottons are described at paras. 16 to 21. 37½ acres were under Kharif fodder, 6 acres under wheat, and 12½ under berseem. 42½ acres were manured with castor cake, 6 acres 15 gunthas with Farm Yard Manure, and 15 acres 38 gunthas with silt. The seed produced was 9,672 lbs. F4, 8,054 lbs. 285 F, 12,029 lbs. of 27 W. N. and 566 lbs. 30 W. N. The closing valuation of dead stock on 31st March 1924 was Rs. 11,260 and of live stock Rs. 836 for 27 bullocks. Contingent expenditure amounted to Rs. 7,380, sales to Rs. 19,369, and produce issued gratis Rs. 11,473.

8. This farm suffers from the shortage of staff which meant that during the year it was for several months controlled by the Superintendent of the Mirpurkhas Farm, Mr. Umershah, in addition to his own duties.

9. The Chellaro sub-station's place in the production of cotton seed is described under cotton. The station is sublet to haris. 1,678 maunds of phutties was produced from 242 acres, giving an average of 6·9 maunds per acre. The highest output on one hari's holding was 17 maunds 14 seers per acre. 280 maunds of phutties, the last 2 pickings were rejected for seed supply, and the remainder gave 918 maunds of seed. The whole cotton produce was worth Rs. 28,143 of which 2/3, Rs. 18,749 was the hari's share. Even charging the whole of Rs. 3,888 for karia excavation as current expenditure the station showed a profit of Rs. 4,996, and this is sufficient to meet the cost of salary and travelling allowance of the permanent establishment and to show a clear profit of Rs. 1,136. Mr. Jaffurali manages this station.

10. The Larkana Farm is 65 acres in area and of this 24½ acres were under paddy and 21½ acres of high land under other crops. Mattar followed paddy on 18 acres 11 gunthas and berseem on 9 acres 19 gunthas. The rest is occupied by buildings, roads and drains. A pump on the Ghar Canal enables the farm to grow Rabi crops, and to sow rice early. Mr Baluch, the Superintendent, describes the research in hand on rice, with reference to seed economy, time of transplanting, dry season, ploughing, Rab substitutes, rotations, manures and duties of water. Some of these are mentioned under para. 23 which also covers Mr. Thadani's work. The classification of jowars is in progress and varieties are being tested. Wheat varieties are being compared, and the place of berseem in the rotation is being investigated.

Berseem is being allowed to go to seed, to see if it is possible to organise its seed supply in Sind and to avoid importation from Egypt. Dead stock on 31st March 1924 was valued at Rs. 9,446 and 7 bullocks at Rs. 1,076. Contingent expenditure amounted to Rs. 7,055 and sales to Rs. 1,631.

11. The Jacobabad Farm is a seed station for Pusa 12 wheat and a machinery testing station. No fine experimental work is attempted. Mr. Mahomed Umarkhan Barakzai, the Superintendent, is studying farm management, and instances as an important question the overlap of Rabi threshing operations and early feed work for the Kharif crop. The farm is watered by flow, and by a pump driven by a Cletrac tractor.

12. 71¾ acres were sown with Pusa 12 wheat, and 19¼ with other varieties. The cropping scheme planned 56 acres of gram, but water was only available for 10 acres, and three Pusa types 18, 25 and 6 were sown. Jambho was grown on one acre. 690 maunds of Pusa 12 seed were sold for the 1923 crop. The amount available for sale in 1924 has not yet been threshed and weighed.

13. A Cletrac tractor is doing excellent work. Mr. Barakzai estimates the cost per acre of ploughing with a two furrow plough to a depth of 7 inches at Rs. 3-7-7 per acre for fuel, oil and labour, and on a working year of 200 days, overhead charges of Rs. 2-6-8 per acre. The rate of ploughing is one acre and a half per hour, and the tractor was not fully loaded with a two furrow plough. The Superintendent considers that there is a big field and an immediate field for tractor ploughing, and if private enterprise will not come forward, I strongly recommend Government to buy another tractor and a three furrow plough and to provide staff and to hire it out. The closing valuation of farm dead stock was Rs. 4,360 and of experimental machinery Rs. 15,577. Capital expenditure from contingent grant amounted to Rs. 5,556 and working expenses to Rs. 4,257. Cash receipts were Rs. 7,881.

14. The farm report reads as that of a capable farm manager.

15. The Sukkur Farm is irrigated by a pump, and affords a standing demonstration of thorough reclamation of kalar land by liberal watering. Except for 3 acres devoted to testing wheat strains, and 28 gunthas to vegetables, the farm is now devoted to the production of fodder for the buffalo dairy herd. 19 acres were under berseem which is the principal fodder crop grown in the cold weather. 17½ acres were under jowar in the Kharif season. Maize was sown on 2 acres in March. It gave a poor yield but is a useful carry over fodder between berseem and jowar. Guar and Udid were grown on small areas in June. Gram sown on two acres after jowar failed. Shaftal was grown on a small area, and unlike berseem can be made into good hay.

A steam engine is used for pumping and chaff cutting. Rs. 1,032 had to be spent on repairs. Other costs for the year amounted to

Rs. 3,232 for 1,880 working hours. The Superintendent, Mr. Ali Mahomed Ulvi, calculates the cost per acre for one Kharif watering as Rs. 3-13-0 and for one Rabi watering Rs. 7-10-0.

16. The strength of the dairy herd at the close of the year was 12 buffaloes of the old stock, 2 heifers with first calf, one in calf, and 31 young stock and 2 bulls. Four cows were sold during the year. 17 calves were born, of which 2 died and 4 were sold. 13 of the young stock are kept at Larkana. The number in milk ranged from 9 to 15 and the yield of the herd was 64,386 lbs. of milk. The best cow gave 6,176 lbs. in 300 days. The year's working resulted in a loss of Rs. 906. If this farm is to be looked upon as a dairying enterprise I do not think that it will succeed. Mr. Ali Mahomed looks after the stock well and the value of his farm for the future depends on the need for establishing a buffalo stud, and on this I cannot express an opinion for want of experience.

Cotton.

17. The study and selection of varieties in the past have led to our handling two cottons on a large scale, a selection from the Deshi cotton known as 27 W. N. and Punjab American F 4. For the immediate present, a pure seed supply of 27 W. N. is of major interest on the Jamrao and there is no reason why this cotton should not spread a very long way as our organisation for seed supply develops. Previous reports have described this organisation and the need for renewal of a fresh basis of self-fertilised seed every year, because of inevitable cross fertilisation in the field with other varieties. An area of 4 gunthas is self fertilised on the Mirpurkhas Farm, and this gives enough seed for 1½ acres on an "Increase Block" on the same farm. In the 3rd year this becomes 30 acres on the Seed Farm, and in the 4th year 600 acres on the Chellaro station. The Chellaro produce is ginned under our supervision, and the seed as far as possible distributed in compact area. The growers agree to market their cotton under arrangement with a firm who undertake to keep this seed of the 5th generation separate from the bulk of the seed they handle. Here I think Departmental activities must cease. If we can give a reasonable guarantee of purity to seed of the 5th generation as available in the ginning factories, it is as much as our staff can undertake and as much as we can reasonably ask Government to finance. The trade, who have freely expressed their opinion on the superiority of 27 W. N. over Deshi types must work with associations of growers to secure supplies, and the growers must associate with leading firms to deliver pure and in bulk a cotton which the firms readily pay a price considerably better than they pay for ordinary cotton. Here is a splendid field for co-operative organisation the big stumbling block in that agency and banking, as available to the ordinary individual are not separate enterprise but I am sure that a close study of the marketing system will show a way, as it has done in the south of the Presidency, where a new method of marketing has done much for co-operative sale.

18. The Punjab American F 4 depends for its success primarily on the early water supply. We have not yet developed an organisation for seed production in Sind beyond growing 24 acres on the Seed Farm, and are dependent on importations from the Punjab. In 1923 the seed for the 1923 crop was supplied by local firms and was very impure, but the fact that 7,000 acres are estimated to have been sown, shows how keen the people are on this cotton and led to arrangements for the importation of 4,000 maunds of seed from the Punjab. This under Mr. Gulmahomed's management has been imported and sold for the 1924 crop as well as 79 maunds grown on the Seed Farm. The seed imported is certainly botanically impure, and this points to the need for organising our seed supply in a similar way to that adopted for 27 W. N. As a beginning, a small area was self-fertilised in 1923.

There is no question that American type of cotton has a great future when early water becomes assured. Whether the best variety is Punjab F 4, or 285 F, or whether we shall establish a better variety than either of these, by selection and crossing of imported varieties, remains to be seen. Apart from the superiority of the American types over Deshi types, previous records show that the Americans are earlier, and not nearly so likely to derive benefit from water which might be applied to Rabi, as are the local types.

19. For the present, 27 W. N. finds its special market and we must continue to organise its seed supply. For the present and for the future we need an American cotton station where early water is assured, and this means a pumping station.

20. Cotton research under Mr. Thadani's guidance is directed largely towards the search for better American strains, but his work is hampered by the uncertainty of the water supply at Mirpurkhas Farm. Of the two Punjab varieties handled, 285 F has a one inch staple, against 6/8″ of F 4. There seems to be but little difference except in ginning outturn in other characters which go to make a good farmer's cotton, and if the current season confirms these results, I think that 285 F should replace F 4. To get finally satisfactory tests it is, however, necessary to establish and multiply in Sind pure strains of the original types created by the Punjab Agricultural Department. Seed imported by the Trade is not pure, and F 4 of one year is not necessarily the same as F 4 of another year. As a basis for this, a small quantity of pure seed of each variety has been obtained from Lyallpur.

21. Mr. Thadani is studying the outturn per plant of various American strains imported a few years ago, and is also making detailed observations on staple, ginning outturn, flowering period, maturing period, and on the relative numbers and positions of fruiting and non-fruiting branches. Some new varieties have been imported from America for 1924 sowing, but only a small amount of the seed has been sown, hoping that we shall have better water facilities for sowing the bulk of the seed next year. We are ready to launch out on a promising programme as soon as our pumping station is established.

22. Observations on yield, ginning outturn, and earliness have been made on 27 W. N. in comparison with Jamrao Deshi cotton. 27 W. N. has a long history and is the product of many years work on local cotton. We are convinced of its superiority, and I hardly think that we shall now find variations in the local crop which are still better. It may have value for research on inheritance but beyond this, I am of opinion that research work on it should cease.

Rice.

23. Mr. Thadani has sent in an article for publication as a Memoir which describes his research work on rice. He records a morphological description of varieties handled and discusses results of preliminary work regarding fertilisation, sterility and the biometrical study of various characters, and recounts the progress made with rice breeding.

24. The study of the natural course of fertilisation is a very necessary preliminary to breeding, and the conclusions arrived at are that self-fertilisation is the rule, that pollination of a plant may continue over 5 to 7 days, that flowers do not open before 7-30 a.m., or after 12-30 p.m. and that flowering is most profuse between 10-30 and 11-30 a.m. That the range of temperature during the hours of flowering is 86° to 99°.

25. Sterility, the failure to form mature grain, is common, and as high an average as 34 per cent. sterile flowers per head have been counted. The causes of this have not been traced and further study in field and laboratory is an urgent need, and it is hoped that facilities for cytological study will soon be provided. Protecting the plant in muslin bags, the plant breader's usual method of assuring fertilisation, causes a great increase in sterility.

26. The biometric studies aim at measuring variations in and recording average measurements of, characters which have a bearing on those two complexes, capacity to yield and market value. This class of work needs great patience and perseverance because of the large numbers of plants handled. A knowledge of the measurements of such characters as numbers of tillers, length of ear, weight of grain per plant, shape of grain, is of great importance to the plant breeder when selecting varieties whose character he wishes to combine in the evolution of a better plant. A knowledge of the range of variation of one character in one variety is very necessary, to enable him to judge the probability that a single plant which in his breeding plots shows a higher measurement of this character than the parent plant, will or will not yield progeny with this higher measurement.

27. The breeding work is directed at increase of yield and securing an early, high yielding variety. In interpreting plot yields, a method of calculation has been used which I hope will stand the

test of criticism on publication, and if so will go a long way towards solving the problem described in para. 6 above.

28. Mr. Baluch's work on rice extends some of that described above to comparison of varieties on a large scale and otherwise deals with problems of irrigation and culture. Duties for rice cultivated on flow and on stagnant water are being worked out, it has been shown that a very much smaller seed rate than is usually practised, can be adopted. Dry ploughing with an iron plough has been shown to be beneficial, and is being practised by some, and it remains to be seen how far it will fit in generally with the farm economy of the tract. Early sowing of seed beds under present conditions must I think be regarded as an insurance. If lift water is available it is probably worthwhile to sow in anticipation of the earliest date on which flow water can arrive, and subsequently if necessary, sow again. The problem will assume a definite form when the arrival and continuance of water supply come under definite control. Duties under stagnant and flow water are being compared, but no conclusions are yet possible.

29. Research work on wheat was described in last year's report and continues at all the Experimental Farms. Yields of four strains calculated from fourteen 200 feet rows of each measured separately, show no difference outside the limits of probable error between the yields of these and of Pusa 12. Of bearded strains, Mr. Thadani is of opinion that C. S. 24 and 25 are definitely superior in yield to Punjab 11, which we have been distributing hitherto in Jamrao tract. Jacobabad, as mentioned above, is the base for the seed supply of Pusa 12. Further organisation is not completely worked out, but it is hoped that two seed societies promoted recently will take a prominent part. Government sanctioned a grant of Rs. 5,000 to cover loss on importation of large quantities of seed for the coming Rabi season. For various reasons which I have detailed in a special letter, I have not carried on with this scheme, my chief reason being that I thought visible local supplies were ample to meet the probable demand for seed, and that bigger supplies forced on the market would not be used for seed.

Other Crops.

30. The only other crop which is receiving detailed botanical study is jowar. The growing of bajri, berseem, mattar, guar, jambho is incidental to the management of the farms.

Fruit.

31. The work on fruit is concentrated at the Mirpurkhas Farm. An attempt to compare some grape varieties in the Municipal Garden at Shikarpur has not been very successful.

Grapes, citrons and mangoes are the principal features of the Mirpurkhas Farm garden. Varieties of all are being compared

The nursery supplied to the public Rs. 425 worth of young plants and cuttings, amongst which the principal items were 348 oranges, 73 Bombay mangoes, 37 Pomeloes, 35 grapes. Fruit realised Rs. 3,312 of which oranges accounted for Rs. 2,074 and vegetables realised Rs. 107. An attempt to establish grape cuttings imported from Poona long after the Sind plant had passed its dormant winter stage have failed. If cuttings cannot be imported from Poona in the winter, then I think the only way is to establish young plants in Poona, in pots, and bring them undisturbed to Sind.

Implements and Machinery.

32. To a man coming from the South Deccan, where the heavy plough is spreading so rapidly, it is at once remarkable that, of iron ploughs only the very lightest type is used at all, and that as a general rule, nothing has been found superior to the Egyptian plough. I doubt if any implement can be found to turn a furrow in dry heavy Sind soils and, if dry ploughing is to become an essential part of Sind farming, the bullock power implement needed may be an iron frame carrying a steel share similar to that of the Egyptian plough, and a bar point below the share, or in other words a rigid, heavy, one tyned cultivator.

33. Sowing in lines with a single tyned drill has been demonstrated for some years past—its advantages need no repeating, but the stumbling block to progress is the slowness of the operation. Sowing under normal conditions of inundation must be done quickly and if drilling, with its great advantages is to replace broad-casting, a multiple tyned drill must be designed, or found. The Hoosier drill is very useful for wheat at Jacobabad, as was reported some years ago. An American Cotton Planter has been used successfully at the Seed Farm.

34. The Cambridge roller continues to do useful work. Reaping and threshing machinery are being investigated.

35. Tractor ploughing probably has a great future as mentioned when discussing the work of the Jacobabad station. Two types have been tried, the Cletrac and the Austin and I think there is no doubt that the caterpillar type is infinitely the better for Sind.

36. The future for implements, and machinery which involves unusual capital outlay to save labour or otherwise to give greater efficiency, will depend on the entire rejection of the fact that the ordinary individual cultivator cannot buy, as an argument against their being used. The average individual cannot afford the capital investment if he has ready cash, let alone if he has to borrow. Their future will depend on the enterprise of non-agriculturists or zemindars, who have capital to invest and will either individually or in limited liability association, purchase machinery and hire it to their neighbours.

37. Mr. Tambe, the Mechanical Assistant has been engaged in repair work, well boring, and consulting. He certifies all the farm engines to be in good order. This section of the work is one of the most important, and the most understaffed in the Division, and I am convinced that money spent to develop experimental mechanical engineering will be well spent.

Agricultural Education.

38. Agriculture is being introduced in the Upper standards of a few primary schools. This is an experiment which has great possibilities. An attempt to introduce a secondary agricultural schools failed, because I think the course was suitable for the town bred boy going on the land, and he does not exist—the land bred boy goes in for secondary education to get off the land. The introduction into the primary school of the elements of the sciences in their relation to agriculture is a recognition that a farmer educated in the science of his surroundings is well educated and leaves school well equipped to follow his father's profession, and under no handicap if he wishes to carry his schooling further.

The Future.

39. In conclusion I would say a few words as to the future. An Agricultural Department, to achieve success must be able to look ahead agricultural experiment of all classes generally takes several years to yield definite conclusion, and now that Sind agriculture is destined to change so radically in the course of a few years, it is time to abandon research work which can only have a bearing on farm economy of the immediate present. A future for the Sind Agricultural Department has already been drafted in broad outline by the Commissioner in Committee, and I can only express a hope that the close of the year will see the Department in a position to look ahead with full confidence to a definite policy involving large expansion.

40. The problems outlined for solution fall roughly into three categories:—

(1) those involving the improvement of the plant.

(2) those involving chemical and physical research into the causes of and remedies for infertility of soil and

(3) those directly concerned with farm management and economy.

In connection with the last, I would issue a word of warning. A system of farming worked out to conserve fertility on a farm managed as a freehold estate with paid labour, may break down when applied to other forms of tenure.

41. I have heard the opinion expressed that it will be time enough for the Agricultural Department to start in when the barrage water comes. With this opinion I most emphatically

disagree. The future of agriculture in a country dependent on irrigation must be much more a controlled future, than need be the case of a country farming under rainfall, and an Agricultural Department should start in at the beginning to help those responsible for land legislation and water control to guide the country's future to the most profitable ends, and should not be called in to find out how to make the best of farming conditions, created without its help. The existing Department has been consulted up to the present stage of development. The wish for its immediate expansion and continued help has been emphatically expressed in the report of the Committee referred to above, but it will not be able to help without expanison, and without confidence that its work will be adequately financed.

42. Sir John Russel enumerates the following factors for success in farming:—

(1) The crops must suit the soil and the climate.

(2) The system of husbandry, *i.e.*, the method of growing and disposing of the crops must suit the local conditions and the markets.

(3) Given suitable crops, failure may still result from

(*a*) Insufficient plant food.

(*b*) Insufficient water.

(*c*) Insufficient air for the roots.

(*d*) Too low a temperature.

(*e*) Too little root room.

(*f*) Some harmful quality in the soil or some plant disease.

I have heard the argument advanced that our proposed pumping stations in Sind will lead us astray, because we shall not have silt to contribute to the removal of the factor "insufficiency of plant food", but, even if the pumping station cannot solve the problem of sufficiency of plant food, surely it can study the other limiting factors and also help to evolve suitable crops by importation, breeding and selections.

Opinions differ as to whether silt will supply plant food necessary for maintenance of fertility or whether stock farming will have to form a much larger part of the farmer's enterprise. If the latter, we shall be launching largely into the unknown as regards a system of farming, and may be involved in the careful fostering of stock and stock produce markets. If the experiment station cannot answer this problem, are these places in Sind where intensities approach those anticipated, and where a careful study of opinions and statistics can be made on the maintenance of fertility by silt laden water unaided by manure?

APPENDIX I.

Work done under the Professor of Agriculture, Poona, during the year 1923-1924.

Charge.

Mr. B. S. Patel was in charge of the Office of the Professor of Agriculture throughout with the exception of 20 days at the end of this year during which I was called upon to officiate. Mr. Patel held charge of the Office of the Deputy Director of Agriculture for Cattle Breeding in addition to the duties of the Professor of Agriculture from April until I relieved him.

Lines of Work.

The principal function of the Professor of Agriculture is to be responsible for the teaching of the Agricultural subjects of the University courses for the degree of the B.Ag. at the Poona Agricultural College which represents about 50 per cent. of the total work of teaching. For teaching of the practical side of the subject, a large farm and a dairy have also to be run, which further involves the administration of these two large institutions. Side by side with teaching, the College Dairy is also intended to be conducted on business lines. Similarly the farm serves as a head-quarter place of demonstration of improved implements and machinery to be recommended by the Department and of stocking the same as well as seeds for sale.

Staff.

The strength of the staff of Assistants which consisted of two Assistant Professors in the Bombay Agricultural Service and six graduate Lecturers and Demonstrators has increased by one post of graduate Demonstrator by the revival of the post of the graduate Fieldman College Farm, which was in abeyance. This has removed a long felt difficulty and we are now in a position to attend to the needs of the short course class more fully. There have been, however, many changes in the personnel of the staff. One more graduate Assistant has been made available from the Sassoon David Trust Fund for carrying out investigations into Economic Efficiency of tillage implements.

I. Teaching.

The staff of the Agricultural Branch have had their hands certainly more than quite full with the College teaching and the management of the farm and the Dairy. The addition of a graduate's post as referred to under staff has relieved the over-straining of the Agricultural teaching staff and has helped to improve the teaching imparted to the short course. The extension of the farm area and the improvements made in the cropping scheme have made it possible to afford better facilities for practical farm work and more particularly its business aspect.

The College Farm.

Function.—This is first and foremost an institution for the practical teaching of the students of the College. Propaganda work in the direction of furnishing a museum of implements indigenous and improved and of supply and repair of improved implements and of seeds is also an important subsidiary function of the farm.

Area of the Farm.—During the year acquisition of the land referred to in the last year's report was carried through and a good irrigable area of 32 acres with 3 wells has been added on. This brings the total area of the estate to 276 acres. An area of nearly 12 acres out of this is set apart for the use of the Research Staff of other than Agricultural Branches of the College. A detailed survey including contours was carried out and a fully informed map of the estate is under preparation. The newly acquired land has been cleared out of trees, embankments have been put in and a good deal of development of this area has been partly carried out. Some of the uncultivable area has also been embanked and brought under the plough with a view to improve it and bring it under cultivation. Thus the total cultivable area has risen to 120 acres from 105 acres in the previous year. It is now hoped that the estate thus extended and developed and developing will give sufficient area for educational work (including an illustration of a small business farm).

Season.—On the whole the season, as has been the feature of last four or five years, was not a very prosperous one on the farm. There were practically no premonsoon showers which help a good deal to get land in condition for sowing. Up to the 15th July the rainfall was very precarious. But good enough rain started on 16th July and in a week's time sowings were commenced. From this time onwards the showers were almost continuous till the 15th of August, *i.e.*, nearly for a whole month giving in all 6·92 inches of rain; but the effect was more depressing than useful as it not only made the young plants suffer owing to continuous wet weather but also hindered interculturing and weeding operations a good deal. A month's almost rainless period which followed gave the crops a further set back with the result that in the first week of September the crops showed clear signs of want of moisture. The threatening situation was, however, saved by the storm of 11th September which was followed by almost continuous rain up to the 22nd September. October to January was again a dry period. The total rainfall of year 1923 amounted to 15·56 inches as against an average of 27·11 inches. It will thus be seen that the rainy season has been but an erratic and unsatisfactory one indeed, the effect of which was to practically ruin the *jowar* and groundnut crops. Although *bajri* did very well indeed, cotton and *rabi jowar* were about half the normal.

As regards plant pests and diseases the most outstanding that may be specially noted were:—Thrips on onions, leafcurl on chillies,

wilt on *gowar* and leaf cattapillars on *jowar*. The onion crop suffered considerably, specially the crop grown for seeds; but they did revive and came out successful with two or three sprayings of tobacco decoction and the onset of the cold weather. The leafcurl on chillies in one part of the farm proved very obstinate and in spite of treatment with lime sulphur wash did every serious damage to the crop. Wilt on *gowar* carried off a good crop.

Some noteworthy Features of the year's Results of Cultivation.—Amongst the irrigated crops cucurbits and *suran* have been found to give very high yields and profits, onion, Dharwar chillies and turmeric coming next. The actual statistics for these crops are given in the following table:—

Crop.	Area.	Average outturn per acre.	Net profit per acre.
		Rs.	Rs. a. p.
1. Cucurbits (Pumpkin, Bottlegourd and Cucumber).	20 Gunthas..	21,744	776 11 6
2. Chillies, Dharwar ...	1¼ Acre ...	2,673	117 7 0
3. White cucumbers ...	¼ „ ...	11,932	547 7 0
4. Onions for bulls ...	2½ „ ...	17 040	217 10 7
5. Suran (4th year) ...	¼ „ ...	39,216	1,188 0 6
6. Turmeric ...	1 „ ...	15,264	77 1 6

Note—The calculations of profits provide along with other things for the cost of supervision, marketing charges, interest at 9 per cent. and land rent at Rs. 40 per acre.

Propaganda Activities of the Farm.—Besides the large amount of teaching which is the primary work of the Agricultural College Farm, a good deal of other propaganda work as can be done has always been the feature of this station. The year's activities are summarised below.

Demonstration and Shows.—In September last a very successful demonstration and exhibition was arranged for the benefit of the delegates of the Bombay Provincial Co-operative Conference. The attendance was quite fair and a number of gentlemen took a keen interest in the implement line and also the development of "Mal" lands. The crops standing on the farm at that time attracted particular interest on account of their fairly good stand in spite of the unfavourable rainfall.

Considerable work was also done in collecting and preparing the section of Agricultural products of the Bombay Agricultural Department's quota to the British Empire Exhibition.

The Agricultural College Farm and the College Dairy also exhibited a very interesting and large set of exhibits at the Indian Industrial Exhibition held on the Deccan Gymkhana grounds and also regularly attended the exhibition for 15 days in May to explain the exhibits to visitors. Great interest was taken by several visitors in the Agricultural Department stall.

Besides these two chief functions there has always been a regular stream of visitors that have been shown round and advised in regard to their difficulties.

Sale and Repairs of Implements to Public —Owing to reduction in prices, specially the heavy reduction of Kirloskar Brothers' implements, the sale of ploughs and spares increased beyond expectation and a comparatively large sale was effected. There have been weeks when numbers of customers had to go back disappointed on account of the firms' inability to replenish stocks. The total sales during the year amounted to Rs. 8,550 bulk of which is represented by Kirloskar's ploughs and spares of foreign ploughs.

Sale of Seeds and Manure.—A very large number of orders for seeds and manures have been met through reliable dealers and agencies besides the farm itself supplying large quantities of field crop seeds, such as groundnuts, jowar, onions, cotton, &c.

Publications.—Mr. K. S. Kulkarni, Lecturer in Agriculture and Superintendent of the College Farm, continues to be the Editor of the Marathi Magazine " Shetki and Shetkari " in which capacity he is required to do a very considerable amount of writing of articles besides ordinary editorial duties.

The Dairy.

Purpose.—Besides serving as a place for practical teaching of Dairying at the Agricultural College the purpose of the Dairy is to work out and demonstrate the possibilities of Dairying as a business on modern up to date lines.

Staff.—The charge of the Dairy was held by Mr. H. G. Baluch, B.Ag., Assistant Professor and Manager, till the end of December 1923 after which he having been deputed to Bangalore for higher training in Animal Husbandry for 15 months, Mr. M. M. Desai, B.Ag., has been acting in his place. Mr. H. G. Baluch was also deputed to investigate the Bhagnari Breed in Sindh for two months during which his Assistant, Mr S. M. Patel, B.Ag., carried his work on. The Manager is assisted by two graduates one of whom underwent a change of personnel during the year.

Herd.—The herd consists in all of 245 animals out of which 36 were cows and 56 buffaloes and nearly a corresponding number of heifer calves of each. The remaining were breeding bulls, bullcalves and working bullocks. This situation differs from the last year's principally in the reduction of 7 cows and 8 buffaloes as a result of disposal of some uneconomic animals, other constituents remaining practically the same. Sindhi cows, Surati Buffaloes, and some cross buffaloes are now the only breeds maintained.

Breeding.—Certain animals had been marked out last year for observing and further building up of strains for higher milk production. The performance during the year as recorded below shows that the strains are continuing to come out pretty well this year also.

Cows.

Strain.—Zankar (Female), 3,117 lbs. average of 14 years.

Name of offspring.	Dam.	re.	Average yield.	Period under observation.		Average yield at the end of previous year.	Remarks.
			L s.	Y.	M.	Lbs.	
Changuni ...	Zankar ...	Battasha ...	3,741	7	0	3,741	Died.
Ohrissie ...	Changuni ...	Daulat ...	3,444	3	10½	3,590	
Amy ...	Do. ...	Pitambara.	3,823	2	11	3,894	
Clarissa ...	Do. ...	Housha ...	2,936	2	3	3,316	

Cows.

Strain.—Begum (Female), 2,379 lbs. average of 11 years.

Name of offspring.	Dam.	i re.	Average yield.	Period under observation.		Average yield at the end of previous year.	Remarks.
			Lbs.	Y.	M.	Lbs.	
Beatrice ...	Begam ...	Daulat ...	2,429	3	7½	2,310	
Bele ...	Do. ...	Gopia ...	2,739	1	2	1,444 for five months.	

Another strain that we are now introducing by line breeding from the Sire line is *Housha.*

Strain.—Housha (Male).

Name of offspring.	Dam.	Sire.	Average yield.	Period under observation.		Average yield at the end of the previous year.	Remarks.
			Lbs.	Y.	M.	Lbs.	
Barbara ...	Casandra having 1,106 lbs. average of 2 years.	Housha ...	3,788	3	7	3,888	
Barshi ...	Barbara ...	Shivaji ...	4,110	1	1	1,421 in 4 months.	

Average performance of some of the other high yielders which are likely to afford suitable material for breeding has also been continued under observation with the result that the following individuals have conclusively proved to be worth using for building up high yielding strains :—

Serial No.	Name.	Years under observation.	Average annual yield in lbs.	Dam.	Sire.	Remarks.
		Y. M.	Lbs.			
	Cows.					
1	Auriline ...	5 0	3,817	Sundra ...	Daulat.	
	Buffaloes.					
2	Louse ...	5 3	4,039	Ghelinala ...	Bhimbhai.	
3	Sajani ...	18 0	3,367	Padi ...	Not known.	

Age at First Calving.—It has been possible during the year to bring down this age on an average from 3 years and 6 months to 3 years and 5 months in the case of cows, and from 4 years and 9 months to 4 years and 8 months in the case of buffaloes.

Period between two Calvings.—On an average this period is about 400 days in the case of cows and 500 days in the case of buffaloes and it is also to be noted that the period between the first two calvings is longer than the subsequent ones—both for cows and buffaloes.

Fodder Production.—In all 160 acres were cropped during the year as against 130 acres of the previous year. The average yield of fodder during the year per acre under cultivation works out at 23,751 lbs. of green fodder as against 18,142 lbs. of the previous year which work out a cost of annas five and pies six and half and annas eight and pies 3 per 100 lbs. respectively. This was achieved by an increase of area under cultivation by about 30 acres, a change in rotation and more intensive cropping. The rotation we now adopt is *Nilva Jowar* mixed with *Chavali* (in the monsoon) ; oats and peas (in the cold season) ; and maize and *Chavali* (in seasons other than winter) and lucerne and guinea grass as perennial fodder crops.

Result of Milk Yield, Cost and Price realised.—The following statement records the results of the year in this respect :—

Year.	Average No. of animals.	Total milk production.	Average yield per head per year.	Cost of producing 100 lbs. of milk.	Total milk fed to calves.	Total disposal.	Value realised per 100 ibs.
		Lbs. oz.	Lbs.	Rs.	Lbs. oz.	Lbs.	Rs.
1922-23 ...	93·75	249,009	2,656·0	21·3	14,513	234,496	19·8
1923-24 ...	105·3	251,068-8	2,384·0	17·3	18,293-10	232,775	15·6

Net Financial Results of the Year.

Year.	Total expenditure of the year.	Income.			Net profit.
		From milk and milk products.	In other forms.	Total.	
1923-24 ...	43,596	39,214	11,497	50,71	7,115
1922-23 ...	53,188	49,383	7,857	57,240	4,052

From the above data it is to be seen that the average yield per year per head shows a decline by about 9 per cent. which is mainly due to the fall in yield from buffaloes, cows having maintained their performance as in the previous year.

However, we have been able to produce the milk cheaper by about 20 per cent. which is mainly due to growing fodder at a less cost per 100 lbs. and to obtaining higher yields.

The value realised per 100 lbs. of milk yield shows a drop of about 21 per cent. which is due to more quantity of milk which had to be fed to a comparatively larger number of calves, to the loss of Sassoon Hospital Custom at a higher rate which necessitated the separation of that quantity to be eventually disposed of as ghee fetching only about one-fourth of the price for whole milk.

The receipts in forms other than milk such as, sale of animals and farm products and increase in valuation of live stock have, however, been more than those of the last year, and thus the net profit of the year under report is more than that of the last year by about Rs. 3,000.

This will show that the hope expressed in the last year's report about the possibilities of making dairying a business proposition even with the present prices of milk is on the way of being realised.

II. Research and Investigations.

Very much as every member of the staff would desire to have opportunities for carrying on some Research and Investigations, they are so fully occupied by teaching, their first and foremost duty and the administration duties in connection with the Farm, the Dairy and the Propaganda that there is practically no time and no necessary peace of mind left to do any Research or Investigation Work. About 45 hours a week of each member are taken up by this with the exceptions of two or three junior demonstrators who have to put up 35 hours a week.

Economic Efficiency of Tillage Implements.—The Professor of Agriculture has, however, undertaken since late in the year under

report, research work in the Economic Efficiency of Tillage Implements for which one Graduate Investigator and the necessary funds have been provided from the Sir Sassoon David Endowment Fund. The work is started only two months since and there is no progress to report this year.

The other members of the staff have also been persuaded to consider if they can fit any small pieces of investigation which would not demand continuous attention at a stretch but can be done at shorts off periods and left off and resumed again as other duties permit. It is hoped we shall have something to reprot under this in the next year's report.

V. G. GOKHALE,

Ag. Professor of Agriculture.

APPENDIX J.

Report of the Work of the Agricultural Chemist to Government of Bombay, from 1st July 1923 to 30th of June 1924.

During the year under report I was in charge of the Office and Laboratory of the Agricultural Chemist to the Government of Bombay, Poona.

2. The work under me may conveniently be divided into five sections for report. They are: (1) Analytical work, (2) Investigation work, (3) Teaching at the Agricultural College, (4) General Supervision of the Manure Mixing Laboratory attached to the Union Agency and (5) Water Finder Work.

Analytical Work.

3. The number of samples received during the period under report is given below. These samples do not include those analysed for investigation work carried by the chemical section although they include samples analysed in connection with the investigation carried on by other sections of the Agricultural and other Government Departments:—

	Private.	Government.	Total.
Soils ..	95	358	448
Manures ...	137	78	215
Waters ...	50	350 and 85	485
Feeding Stuffs ...	10	12	22
Oil Seeds and Oils ...	10	33	43
Milk and Milk Products ...	19	6	25
Vegetables ...		11	11
Fruits ...	3	43	46
Miscellaneous ...	97	10	107
	421	981	1,402

4. The number of samples received, continues to be as large as in former years both from Government Departments and private persons and the samples are fairly distributed all over the year. The number of samples received this year compare with the previous five years as given below :—

Year.	Total No. of samples.	No. of samples from the public.
1918-19	... 1,162	393
1919-20	... 1,355	396
1920-21	... 1,146	305
1921-22	... 1,142	184
1922-23	... 1,412	471
1923-24	... 1,402	421

5. The samples received from Government Departments are not for mere general information but there analyses are required in the investigation of the various problems on hand. The soil samples for instance have been analysed mostly in connection with the cotton investigation work or the growing of cotton under new system. A large number of water samples (350) were done for the P. W. D. in connection with river silt experiments. Some water samples were analysed for the Economic Botanist in his investigation on weeds growing in canals. Oil-seed samples also were done for the Economic Botanist in his study of the oil contents of the different varieties of safflower seed. The Horticulturist to Government of Bombay is engaged on selecting the best varieties of the various fruits grown and, therefore, several fruit samples were analysed for him. In connection with rice experimental work at Karjat manures and soils, especially manures were analysed. Thus the chemical Laboratory helps directly in solving many of the problems which the Department has on hand.

6. The real test of the success of the Laboratory, however, is not shown by the use which the Government Departments make of the Laboratory. It is shown by the use which the public and especially the cultivators make in getting their samples analysed and their difficulties solved. A large number of samples are received from the actual cultivators and from men engaged in industries depending on agriculture. In the year under report the actual number of samples received from the public was 421.

7. The character of most of the samples was nearly the same as in previous years. Majority of the soil samples sent by cultivators was from lands that do not yield the usual outturn or have degenerated in recent years. The water samples in most cases were for determining the salts to find out if the waters were in any way injurious.

8. Two years ago it was pointed out that many times the manures are adulterated and the cultivators lose much by not getting them analysed. Last year the Agricultural Department issued a leaflet advising the cultivators to invariably get their ammonium sulphate analysed as that manure was found to be very much adulterated in some cases that were brought to the notice of the Department. It seems that the cultivators are now beginning to understand the importance of getting their manures analysed.

In the year under report the manure samples received from the public were 137 as against 92 in the previous year and only 37 in the year 1921-22. This shows an awakening in the agriculturists. Ammonium sulphate and oil-cakes are the manures which are used in large quantities. Recently ammonium phosphate has come on the market. It varies in composition from 16 to 20 per cent. of Nitrogen and 11 to 45 per cent. of phosphoric acid. A certain gentleman in Bombay has prepared a liquid plant-fertilizer containing nitrogenous and potassium salts. This is not likely to prove to be

economic since the bulk when carried in solution will be very great and the freight charges prohibitive. It is always best to carry the manures in their original solid condition.

9. Dry figs are being prepared by the Horticulturist to Government on a fairly large scale for demonstration and in connection with this a large number of figs both dry and fresh was analysed. The figures of anlayses may soon be published.

10. On the Dharwar Farm experiments are being carried to find how far the jowar fodder deteriorates by keeping or by exposure to the sun. The analyses show that in both cases the fodder deteriorates.

11. Some samples were received under the name of condensed milk. There was very little attempt at condensing the milk but the consistency was made up by the addition of starch and a large quantity of sugar. Addition of sugar is quite good but it is no use selling milk thickened with starch as condensed milk.

12. Some interesting substances of minor importance had been sent for analysis. Among them were (1) wax found on the leaf sheaths of jowar, (2) salt encrustation on the leaves of Plumbago capensis, (3) an essential oil called the Kulfa oil, &c.

Investigation Work.

13. The work in connection with the manuring of the rice crops is being continued in co-operation with the rice experimental station at Karjat.

14. The study of the changes in the nitrogen contents of the soil in connection with cotton growing experiments which are being carried at Surat will be completed in a few months more.

15. The investigation in connection with the recuperation of the nitrogen content in the Deccan soils is proceeding. Some valuable results have already been obtained and it is expected that the results obtained will be valuable.

16. Mr. N. V. Kanitkar, M.Ag., B.Sc., Assistant Professor of Chemistry, is carrying on his village survey work to study the economic condition of the villages. In the year under report he nearly completed the survey of Possari village near Karjat.

Teaching.

17. I was responsible for the teaching of Geology and Chemistry of all the classes at the Agricultural College. The teaching work has become very heavy in recent years and the teaching staff in Chemistry find it extremely difficult to carry on any research work. In addition to the teaching at the College there is generally some teaching work out-side the routine college work. In the year under

report there were two men under special training. Mr. M. K. Nayar, B.A., was trained to be a chemist for a private manure-firm in the Madras Presidency and Mr. M. M. Hasan, B.Sc., was trained to be an Agricultural Chemist for the H. E. H. the Nizam's Government.

Manure Mixing Factory.

18. According to Government Order No. 7790, dated July 27, 1918, R. D., a Chemical Laboratory is attached to the Union Agency with a view to encourage the use of manures by preparing mixtures of manures for the various crops. Mr. V. N. Gokhale, B.Ag., B.Sc., was in charge of the Laboratory from the beginning of the year to the 15th of April 1924 when he went on leave for two months Mr. N. R. Gurjar, B.Ag., was put in acting charge for two months. After the expiry of Mr. Gokhale's leave he was taken back to the College on his original position and Mr. B. H. Patil, B.Ag., was sent to take Mr. Gokhale's place.

19. The analytical work done in this Laboratory includes soils, manures and manure mixtures for the Union Agency in their usual dealings. The total number of samples analysed was 122 and may be classified as under :—

Soil	...	1
Farm yard manure	...	2
Oil-cakes	...	12
Artificials	...	12
Manure mixtures	...	95
		122

20. The special problems on hand at present at the Union Agency Laboratory include the investigation of the use of a certain phosphate alone and in mixture for *bajri*, potato, and plantain crops and the investigation of the effect of that phosphate on other manures when stored as a mixture.

Water-finder Work.

21. For sometime it was a practice to sanction a temporary establishment consisting of an assistant and a peon to work with the water-finder machine. But during the last three years the temporary establishment was not sanctioned and the work had to be done by deputing one of the assistants from the Chemical Laboratory. This deputation means a great inconvenience and loss to the Chemical Laboratory where now-a-days there is such a rush of samples for analysis.

22. Two years ago it was decided to try and find out whether the demand for the water-finder remains even when a charge is levied for the use of the machine. During the last two years a fee

was charged at the rate of Rs. 10 for the first two days and Rs. 5 for every succeeding day. When the machine was given for wells for non-agricultural purposes travelling expenses according to Government rules were also charged. The fees have in no way reduced the demand and the calls are so many that they cannot all be attended to.

23. During the year under report Rs. 524-4-0 were received as charges for the water-finder work. The following table will give a clear idea about the work undertaken :—

Name of the District.	No. of villages visited.	No. of applicants for whom work was done.	No. of spots tested.	No. of idications of water currents given.
Bijapur ...	2	2	14	1
Dharwar ...	1	1	4	1
East Khandesh ...	1	1	5	...
Poona ...	7	7	48	7
Ratnagiri ...	3	4	18	4
Satara ...	3	3	15	1
Sholapur ...	4	6	31	7
Thana ...	7	8	59	8
West Khandesh ...	1	1	4	2
State-Baria ...	1	1	20	3
	30	34	218	34

24. Mr. V. G. Patwardhan, M.Ag., M.Sc., who was Lecturer in Chemistry was transferred to Manjri Farm as Superintendent from 14th November 1923. Mr. V. J. Atgur, B.Ag., has been deputed to the Public Health Department to work as Chemist at the Karachi Sanitary Laboratory from 1st of February 1924.

25. I am glad to say that all the assistants under me worked satisfactorily during the year under report.

D. L. SAHASRABUDDHE,
Ag. Agricultural Chemist,
B. P., Poona.

APPENDIX K.

Work done under the Economic Botanist for the Year 1923-24.

Dr. W. Burns, Economic Botanist, was in charge of the work throughout the year. Mr. G. B. Patwardhan, B.Sc., Assistant Professor of Botany, was on leave for nineteen days in May 1924. Mr. L. B. Kulkarni, M.Ag., Assistant Economic Botanist, was granted study leave for one year to study Agrostology (the improvement of grasses and grass lands) in America. Mr. T. P. Shah, B.Ag., and Mr. R. C. Pendse, B.Ag., successively acted in his place. Mr. D. V. Narayanayya was on leave from October 27 to December 14, 1923. Mr. W. V. Joshi, B.Ag., Assistant Economic Botanist, was on leave for a month and a half from April 15, 1924. The services of Mr. T R. Khadilkar, B.Ag., Demonstrator in Botany, are lent to the Indian Central Cotton Committee with effect from September 1923, and Mr. V. N. Sane, B.Ag., is appointed to act in his place.

Education.

There was an unusually large number of students specialising in Advanced Botany and Horticulture in the final year. Nineteen appeared for the final examination with this subject as their optional and fourteen passed, one of them gaining a first class. Two men who have been working for their M.Sc. under the direction of the Economic Botanist presented their thesis, and both passed, one of them getting distinction and the award of the Moos Medal. The usual share of the teaching of the First, Second, Third Year and Special Course students was taken by the Botanical Staff.

Information.

One hundred and fourteen enquiries connected with Economic Botany were received and answered. In the herbarium one hundred and sixty-four specimens sent by the public and by Government institutions were identified.

Research.

Canal Weeds.

This work has been continued. Mr. C. C. Inglis, P. W. D., Executive Engineer, Special Irrigation District, Poona, has for some years been working on the same problem by other methods and with a different view point. The Economic Botanist and Mr. Inglis have been in frequent touch with one another. Several of their results arrived at independently are now beginning to appear complementary.

It cannot be said that we have reached anything like finality. The process of disentangling the many factors affecting the weed

growth is not easily done. So much also depends on crucial experiments arranged in canal conditions, and it is understood that Mr. Inglis is arranging these.

So far as was possible in laboratory conditions further work has been done by the Economic Botanist and the following are some of the results. For example, the experiment of growing Potamogeton perfoliatus (the worst of the Deccan Canal weeds) in tubs with varying conditions of substratum and water opacity was repeated (*see* pp. 151-152 of last year's printed report). The same four sets of conditions were given. The new experiment lasted from August 7, 1923, till February 7, 1924. Last year the tubs stood in the order of merit 4, 3, 1, 2. This year they were in the order 1, 3, 4, 2. It will be noted that 3 and 2 keep their respective places. Tub 2 had gravel substratum with clear water, and apparently offers the least favourable conditions for the growth of the weed. Tub 3 had silt substratum and silty water and apparently favours growth of the weed. The alteration of No. 1 (Gravel substratum and silty water) and No. 4 (silt substratum and clear water), can, I think, be accounted for by the fact that it was not possible to keep the conditions in either of these tubs uniform for any length of time. The fact that a silt bed is more favourable than any other substratum is a matter of common observation. The main point at issue has been the effect of silty *water*, and this point is not yet settled.

The plants in the tubs were cut off at the soil level in order to weigh the growth made and the underground parts were left in the tubs. The plants in tubs 1, 3 and 4 renewed their growth, but those in tub 2 (the one with least growth) failed to grow. The interpretation of this is not obvious. It may be that the plants were too weak when cut, or it may be that the more intense light killed the terminal bud.

To test the growth of Potamegeton in different depths, two pots were prepared and, in each, plants of P. perfoliatus, approximately equal in strength were planted. These pots were suspended in a well in our horticultural area (Modi Bag) the one five feet and the other ten feet below the water surface. The well water is disturbed frequently by the use of the *mot* but there is no silt. Now and then the pots were hauled up to see how the plants were progressing, but the times when this was done were cut down to the minimum, as there was a tendency when hauling up the pots for the surface soil to be washed out of them. The experiment is not yet concluded but it is apparent that the plant at 5 feet deep has made luxuriant growth and that at ten feet deep very much less growth. The main differing factor in this case is *light*.

The Nira Right Bank, the Mutha Right Rank and the Pravara Left Bank Canals were visited during closures and observations made on the distribution of the weed. These observations need to be correated with the work of Mr. Inglis and other irrigation engineers

who have observed these canals during long periods. As an experiment in the way in which weed would or would not come back into cleared parts of the canal, we cleared two small patches of the beds of canals completely of silt right down to the rock. One of these was in the Mutha Right Bank Canal and measured 39 feet long (at mile 53/4). The clearing was done on October 23, 1923. Observations were made at the closures in February and July. There was very little silt on the cleared area. The alga Nitella had established itself and Vallisneria was beginning to appear. On the Pravara Left Bank Canal a patch 60 feet long was cleared on February 29, 1924. This was observed on June 30, 1924. The silt deposit was already from three to six inches deep, and the area was full of Potamogeton pectinatus. Canals thus differ markedly in their silting capacity and the corresponding growth of weeds, and it is apparent that individual canals need individual treatment But in addition, the principle of the treatment would seem to be some method of stopping silt *deposit*. The question of suspended silt is still an open question.

In the Nira Canal the prevalence of Vallisneria and the absence of other weeds led us to enquire whether their absence might be due to non-infection. A study of the Vir basin showed that other weeds, including P. perfoliatus, were there, so that infection is possible. There must be some other factor which determines their absence.

A search for this factor has been made by having weekly samples of water sent from the Mutha, Pravara and Nira Canals for analysis. The following is a typical analysis:—

Samples collected on March 16, 1924.	Parts per 1,00,000 parts of water.			
	Nira, L. B.	Mutha, R. B.	Pravara, L.B.	Godaveri, L. B.
Total soluble salts ...	10·00	10·00	8·00	14·00
Calcium carbonate ...	3·50	3·50	4·40	5·40
„ sulphate ...	...	...	...	...
„ chloride ...	...	...	...	...
Magnesium carbonate ...	1·26	1·26	0·40	1·65
„ sulphate ...	0·75	.	...	...
„ chloride ...	1·90	0·62	0·30	1·78
Sodium chloride ...	0·58	3·50	2·40	1·70

In addition we have now begun to determine the hydrogenion concentration in these waters. It is hoped in time to get some correlation between these chemical facts and the distribution of the weeds.

I would again insist on the complexity of this problem of plant physiology, in which so many physical and chemical factors are inextricably involved.

Seed Testing.

The number of seed samples received for testing during the year was 219 of which 15 were grass seeds.

The majority of these samples were from Government Agricultural Stations.

The experiment to test seed longevity has been carried on. The results up to date are of the same nature as last year, *viz.*, little diminution of vitality after 2½ years.

Safflower.

As mentioned in last year's report, p. 153, a series of twenty-two pure lines of safflower was received by us from Mr. A. Howard, Imperial Economic Botanist. These were grown for the first time with us in 1922-23 and their progeny in 1923-24 from pure self-fertilised seed. This year a change was made in the method of cultivation with most gratifying results. This is the same method which has yielded such excellent results with cotton at Surat and which Mr. Howard has elsewhere recommended for various plants. It consists in growing the plants on broad raised beds and giving irrigation water in the furrows between, keeping the surface of the beds mulched by cultivation. For our safflower the beds were 6 feet broad and the furrows 1½ feet broad and 1 foot deep. The yield has by this means been tripled.

Numbers 6 and 7 of the varieties continue to lead as to yield among the pure varieties, but some of the crosses made by us outstrip them. This may be due to hybrid vigour. This will be tested next year. We are growing the best variety on a larger scale for purposes of multiplication and we shall also this year attempt to combine in one variety by hybridisation high yield and high oil percentage.

This originally minor research promises to be a thing of considerable importance and we hope in a year or two to be able to present growers of this important oil seed with a race of plants that will increase their profits considerably.

Grass Investigations.

This research is largely financed by the Sassoon David Trust. The main lines on which we are working were fully explained in last year's report (pp. 153-4). The following are additional facts.

At Kalas further development is taking place slowly in the same directions as already indicated, namely, the spread of certain species on the hilly portion and others in the low-lying parts. This year we

arranged to cut, graze and burn for a definite reason. Up to date there has been no cutting, grazing and burning, as we wished to protect the natural vegetation and give it a chance to grow. Our measures had the desired effect. In addition they had an unforeseen result. In the last two years the actual amount of vegetation produced on the land has been considerable. This has all been allowed to ripen and dry. It has then fallen to the ground and formed a layer of fibrous vegetable matter on the soil surface. Vegetable matter if it forms humus is an admirable thing, but this stuff is so fibrous that it rots exceedingly slowly and we found it keeping the rain from the soil beneath it and preventing the germination of the underlying seeds.

We, therefore, selected certain representative strips, one for grazing, one for cutting, and two for burning; one to be burned in February 1924 and the other in May 1924. Our February burning was anticipated by a band of budmashes who burned the tent on the area and set fire to the grass, on February 4. This fire spread over a good deal of the area but fortunately not all of it. We took the opportunity of this fire to map out two plots in order to show the distribution and extent of cover of the perennial grass stumps. The results of these measures will be apparent in the late months of 1924. Our lease of the area expires at the end of the current year but we hope to renew the lease as the area is only half-way towards its climax as a grassland.

Soil-moisture measurements to determine the exact soil conditions in which different species grow have been taken and a properly constructed meteorological station of small size has been maintained to give us accurate climatic records. The yearly observations of "quadrats" and species have been continued. The whole of our information gained at this station and elsewhere is now being embodied in a memoir of joint authorship which will appear in the coming year.

On the invitation of the bodies controlling them, the following Gowrakshans and Panjrapoles were visited:—Kandivlee, Mulund, Dakore, Nasik, Pandharpur. The grass land of each was botanically inspected and plans prepared for the improvement of the grazing and cutting and general management. At Kandivlee these ideas are being given effect to, and to some extent also at Mulund. We look forward to excellent results from this co-operation. At Belgaum two acres were fenced and the vegetation botanically examined. The dominant grass is spear grass (Andropogon contortus). We have started to re-seed a part of the land, in the same manner as was so successful at Government House, Ganeshkhind. The re-seeded plot at Pandharpur gave a yield four times that of the neighbouring ground, although the whole neighbourhood suffered much from drought. At Mohod-Budruk near Pandharpur a most successful silo demonstration was held. At Bankapur the fencing of the area for observation was completed. At Chharodi a preliminary survey of the distribution of the grass species was made and

mapped. In the re-seeded area at Government House now open to grazing all year round, there has been no re-invasion by Andropogon contortus, and the good species retain their dominance.

We gave expert advice and supervision in the re-grassing of the Poona Gymkhana wicket-table in the cricket field. This was a very successful piece of work, and the more so as the whole of the relaying had to be done in the dry season. The grass stood up to the hot weather and was played on frequently in June during which month there was almost no rain. The grass used was hariali alone (Cynodon dactylon).

There was a great public demand for grass seeds, a demand which we could not supply. There is here an opening for the local seedsmen if they will put themselves to the trouble of collecting these seeds from the open country in the months of October-November.

Since the methods of research on nut-grass (Cyperus rotundus) called in Marathi, Lavala, were so successful we decided to apply the same methods to spear grass, Andropogon contortus, and to begin with we are making a close study of the plant from seed to maturity both in the field and in the artificial cultures. We have already confirmed the fact that there are at least two definite varieties, and also the interesting belief that the hygroscopic twisting of the awn in the presence of water helps to bury the seed.

Mr. L. B. Kulkarni, M.Ag., who has done so much in these grass researches is at present in America studying methods of grass improvement in similar areas there, and we hope to have considerable benefit from his increased experience on his return here in December 1924.

Weeds.

The research on the weed Lavala (Cyperus rotundus) was brought to a successful close in the year under report. These results have been embodied in a memoir entitled " The Eradication of Cyperus rotundus, A Study in Applied Botany." This has been accepted by the Pusa Publication Committee for publication as a memoir of the Agricultural Department in India, in the Botanical Series. In our last report (pp. 154-155) a fairly full account of the main discoveries was given. We may now summarise our general conclusions and practical recommendations. These are :—

(1) the prevention of seed production ;

(2) the prevention of the formation of aerial connections by germination seeds or tubers. We have found that until this aerial connection is established no underground tubers can be produced ;

(3) the attacking of the weed as soon after the rains as the soil is workable. The process should include deep ploughing

and subsequent pulverisation, and turning over and over of the soil so as to expose as many tubers as possible to the effect of the sun's heat;

(4) the following of this up in the rains with a thick green-manure crop and a second dry season's continuous cultivation when the land should be clear of weed :—

> If, however, the land is wanted for a rains crop, it should be sown so that intercultivation can be practised and the aerial connection of the Lavala prevented from forming. Thereafter a second dry season's cultivation should reduce the weed and a third dry season's cultivation extirpate it.

The whole of the scientific details are contained in the memoir which will appear in the next few months.

Bajri Investigations.

In this research which is financed from the Sassoon David Trust we are trying to produce a drought-resistant type of bajri. Our methods have been fully described in last year's report (pp. 155-157). This year we have managed to isolate a number of strains practically pure as regards the type of hairiness. This is a long step toward our goal, since, as we pointed out last year our first difficulty lay in the extraordinary extent to which the different types of bajri had crossed with one another. The plant lays itself out to be cross-pollinated. The nonhairy plants have this year again shown themselves to be superior in yield, in size of head and in resistance to Sclerospora attack. As regards resistance to drought :—we grew the plants in four different series in different places, without irrigation, but in no place were the conditions severe enough to make any real distinction between the strains as to drought resistance. This year we have grown two series outside Poona, in the neighbourhood of Manjri, with a much smaller rainfall and the Poona series has been grown on the poorest soil we could find. We hope that these drastic measures will enable us to pick out the drought resisting strains.

In addition we have this year begun a complicated series of experiments on the water requirements of bajri throughout its life and at special seasons. This is following up certain classic work on the drought-resistance of maize in America. Plants are grown in sealed drums with known amounts of water added from time to time, and with weighments of the drums at intervals. We hope by this means to get some accurate facts as to the actual needs of bajri as to water and as to what stage of bajri is most affected by drought.

Fortnightly sowings made during the year bear out completely the findings of last year. They give the comforting information that bajri may be sown successfully as late as August. So in a year of very late rainfall bajri is a perfectly possible crop.

Lantana Eradication.

We invented a chisel in a tube with a spring to bring it back after it had been hammered into the stump of a Lantana bush. This instrument was made to our specifications at the Central Store and Workshops, Dapuri. The instrument proved too clumsy for our work and did not fulfil our expectations.

We then tried mere painting of sodium arsenite solution over cut stumps, with encouraging results. Rapid evaporation seemed to be preventing the soaking of the poison into the wood so we followed up the application of sodium arsenite solution by a layer of castor oil to prevent this evaporation. Trials were made on a large scale on a forest area near Poona where Lantana was common, and this method was used in April and in May 1924. So far, about 75 per cent. of the treated stumps have sprouted which shows that the method has not been effective on the whole. Where there was definite blackening due to the entrance of the poison, there has been no sprouting. There are distinct possibilities in the method. Our one difficulty is to ensure effective penetration of the poison. This we shall try to overcome. The cost of the treatment as now given is approximately Rs. 20 per acre.

Potatoes.

An attempt was made this year to establish a local source of seed supply. Potatoes for seed purposes are annually imported from Italy. We grew the Italian seed in Mahableshwar during the cold weather of 1923-24 to see whether we could thus have a stock of seed for the rainy season in the Deccan. In Mahableshwar the red Italian potato (known in Italy as *patata rose*) is grown to the exclusion of the white Italian in which the Deccan specialises. The white Italian when grown in Mahableshwar gave better total yields per acre than the red sort but produced individually smaller tubers. From the point of view of seed this was not a drawback. The potatoes thus got were stored in Mahableshwar till May when they were transported to Poona and stored in our store beside other potatoes. Within a few days the whole lot of potatoes brought from Mahableshwar rotted and the whole consignment was lost. The other potatoes in the same store were unaffected so that the Mahableshwar potatoes died on account of some infection of their own. This appeared to be mainly bacteria with some Fusarium. We shall repeat this experiment on a smaller scale next year.

The potato flower was studied in order to find out why viable seed is not produced, and as a rule no berries are produced. It was found that the pollen was defective. Berries are, however, occasionally found so that pollen must occasionally occur which is not defective. Our object in studying this matter was to get seed material for the development of new varieties.

Further storage tests were made from the end of the 1923 hot season till May. One lot of potatoes was kept in the Union Agency store house and one in cold storage in Bombay. The lot in Bombay was 600 lbs. and we lost only 2 lbs. from rot in three months. The lot in the Union Agency's store at Poona was of the same weight and was entirely wiped out by rots in 2½ months. There is no doubt that so far the only really efficient way of storing potatoes is in cold storage. This is particularly so in the hot weather.

Of the Scottish varieties, Great Scot has given us far the best results and we imported a ton of it this year which is being grown at various places in the Deccan. This will give us a final idea of its performance. It is also a variety which up to date has not degenerated when grown on in India and it is possible that it may prove to be a competitor with the Italian white round now so popular.

Against Tambera we are now recommending dusting rather than spraying on account of the greater ease with which dusting can be done and the less likelihood of the apparatus going wrong. We have found the best dusting mixture to be 20 per cent. of sulphur and 80 per cent. of slaked lime (dry). Two dustings cost Rs. 6-8-0 per acre.

The Peth pedigree stock is maintained and shows no diminution in its yielding capacity. A small amount of bacterial ring disease has crept into this crop. The stock will be grown elsewhere for two generations to free it from this.

Ring disease, however, does not persist long in the soil. We found this year that clean seed planted in ring-infected soil five months after the removal of the diseased crop was not infected.

Miscellaneous.

Fuller's Teasel (Dipsacus fullonum) is being grown, we believe for the first time in India, by us. A certain firm of wool merchants asked us to provide them with the heads of this plant which on account of its hooks is useful for bringing up the pile on woollen fabrics. We tried several Indian substitutes but in no case were the hooks strong enough. We obtained seed from Britain from Messrs. Dobbie & Co., Edinburgh and are now growing this plant which is doing quite well. It is a biennial so it will take two years to get the heads. If we succeed in doing so, we shall have established one new useful plant in the country which will benefit both industry and agriculture.

Datura fastuosa is a well known weed of waste places. We have found, in all, four types differing in colour, habit and other characters. These offer admirable material for the study of the behaviour of Mendelian characters and we are growing and crossing them for that purpose. The value of these experiments is partly for our students and partly for the science of genetics as a whole.

Algaroba plants, which are fodder trees, are now growing fast and we hope to have the first yield of their pods shortly.

Publications.

Dr. W. Burns, Economic Botanist—

"Scientific Precision". Poona Agricultural College Magazine, XV, 3.

"Scientific Certainty". Poona Agricultural College Magazine, XV, 4.

Mr. G. B. Patwardhan, Assistant Professor of Botany—

"Seed Standards". "Some more Light on the Alleged deleterious effects of cattle drinking water in which Shingada has been cultivated." Poona Agricultural College Magazine, XV, 1.

"Note on Loranthus on Eucalyptus in Poona". Jl. Ind. Bot. Soc., IV, 2.

Mr. L. B. Kulkarni, Assistant Economic Botanist—

"Some Exotic Fodder Plants". Poona Agricultural College Magazine, XV, 3 and 4.

Mr. W. V. Joshi, Assistant Economic Botanist—

"Deterioration in Skin Colour of Potatoes". Poona Agricultural College Magazine, XV, 2.

Mr. S. B. Ranade and Dr. W. Burns—

"The Eradication of Cyperus Rotundus". Memoir of the Agricultural Department in India (in the press).

Mr. W. V. Joshi—

"Further Investigations in Potato Cultivation in Western India". (In preparation.)

W. BURNS,

Economic Botanist to Government,
Bombay, Poona.

APPENDIX L.

Annual Report of the Work done by the Plant Breeding Expert to the Government of Bombay, Poona, during the year 1923-24.

Rice.

Staff.—I was obliged to go on leave from the 26th May to 25th of June 1923, owing to my ill health. Mr. S. G. Bhalerao, the former Superintendent of the Rice Breeding Station, Karjat, was transferred to Mugad on 19th May 1923 and Mr. M. V. Gadkari, Assistant to the Rice Specialist, Karjat, was appointed in his place. Later on, however, Mr. Gadkari was transferred back to the Rice Physiological Section owing to the transfer of Mr. K. V. Joshi, Rice Specialist, to the Cotton Physiological Work at Surat. Mr. R. M. Hegdekatti, a fresh Agricultural Graduate, was then taken in his place. Messrs G. G. Patil and R. B. Patil worked as non-graduate fieldmen.

Season.—The season commenced about a week late. The sowing had, therefore, to be delayed to some extent. The transplanting was not much put off. But the rains were very heavy in July and caused much damage in many places. The excessive down pour at this time retarded tillering to a certain extent, and the practical absence of rain after September interfered with the proper development of the grain. Thus on the whole the season was rather unfavourable.

Method of Work.—The method of work remained practically the same to which we had settled down as described in the last year's report. But my own illness, the transfer of Mr. Bhalerao and the repeated change of staff at Karjat resulted in slight deviations from the proposed line of work, and caused some break in the continuity of the same.

Cultures under Study.—The old strains Nos. 79, 179, 153, 164, 32, 35, 134, 42 and 104 and some new ones such as 184, 17, 39, 65, 199, 202, 8, 82, 136 and 37 a Patni sample were studied intensively. In addition to these a number of new bulk samples and the progeny of several new panicles collected last year by Mr. Bhalerao were studied, and more particularly the latter in some detail. Some of these are likely to be useful.

Behaviour of the old Strains.—On the whole the old strains have remained true to their noted characters, though the unfavourable season caused a general reduction in tillering and yield of grain. No. 121 was not grown this year through oversight. No. 134 did not give very satisfactory results. Attempts were made to purify No. 179 but its cultures cannot be said to be quite pure yet, as they are still showing great variability in the time of flowering and in the compactness of the panicle. As for the others the following table will show the yield of grain in the various cultures under different conditions:—

[Please *see* Table on next page.]

Comparative Table of Yields of the selected Strains and the Cultivator's Sample under various Conditions in 1923.

Name of Culture. Early strains.	Days taken from sowing to harvesting.	Fineness of grains (No. of grains per gram).	Cultures for plant to plant study with 18″ × 8″ spacing and single planting.			Extensive cultures with 12″ × 12″ spacing and 10 clums per bunch.			Comparative cultures with 18″ × 8″ spacing and single planting.			5 Replications with 12″ × 6″ spacing and single planting.	Remarks.
			No. of plants studied.	Average yield per plant in grams.	Calculated yield per acre in lbs.	No. of bunches.	Actual yield in lbs. and oz.	Calculated yield per acre in lbs. and oz.	No. of plants.	Actual yield in lbs. and oz.	Calculated yield per acre in lbs. and oz.	Yield per acre calculated from the average of five replications.	
Strain No. 79 ...	110	51·87	230	*11·63	*1,116	300	12·8¾	1,777	223	6·15½	1,361½	1,408·10	*The yield low due to ravages of crabs and poor soil. †The sample is very coarse.
Cultivator's Seed.													
Ghosali ...	119	38	...	...	...	300	11·0½	1,601	...	...	...	...	
Mahadi ...	126	34	...	...	...	300	10·8½	1,529	...	..	...	...	
Halwar ...	131	44†	...	...	...	300	12·10¾	1,839†	...	...	...	...	
Halwa Kolamba ...	131	61	...	...	...	300	11·8	1,669	...	...	...	...	
Intermediate Strains.													
Strain No. 153 ...	135	72·75	241	23·41	2,248	300	12·10¾	1,839	393	15·10½	1,735·5	1,817·15	
„ No. 164 ...	135	58·90	238	23·00	2,208	300	12·14	1,833	388	14·4¾	1,605·1	1,792·2	
Late Strains.													
Strain No. 32 ...	145	81·20	238	24·13	2,317	1,180	78·8	2,897	393	17·10½	1,957·0	2,041·10	
„ No. 35 ...	145	82·50	242	25·16	2,416	1,200	63·8	2,305	386	17·1	1,925·0	1,860·3	
„ No. 42 ...	145	70·25	240	29·78	2,859	1,320	89·9¾	2,957	394	20·5¼	2,247·0	2,118·	
„ No. 104 ...	155	57·8	250	26·53	2,549	...	...	...	...	...	...	...	
Cultivator's Seed.													
Strain No. 1 ...	145	75·	250	21·28	2,043	1,200	73·	2,649	393	16·1¾	1,785·8	...	
„ No. 2 ...	145	76·	225	24·72	2,326	517	26·4	2,211	315	12·6½	1,715·9	...	
„ No. 3 (Zinya) ...	145	78·	250	24·85	2,367	1,200	64·3	2,330	395	14·4	1,571·7	...	
„ No. 4 (Ghudya) ...	145	88·	250	25·24	2,423	1,380	73·05	2,314	392	13·6	1,486·6	...	

It will be seen from this that strain No. 42 has always given the highest yield of all the selected strains and the cultivators' samples with which it was compared respectively in four and three different series. No. 104 comes next to No. 42 in yield in the extensive study series, where alone the two could be compared with others this year. No. 32 comes next to No. 42 in three series and No. 35 next to No. 32 in two series. Coming next to the early and intermediate strains which have generally rather low yields, Nos. 79, 153 and 164 have given better yields than three of the cultivator's intermediate samples. The remaining sample of the cultivator is only equal in yield to Nos. 153 and 164 though it yields better than No. 79. But all the three strains are comparatively finer grained and No. 79 is even earlier than the cultivator's sample.

Purity and Yielding capacity of the new strains taken up this year.—These have shown pretty normal frequency distributions in all the important characters.

Statement showing the Comparative Yields and other important Characters of the Strains taken up this year for extensive Study.

Strain No.	Date of flowering.	Fertile tillers.	No. of grains per gram to show fineness.	Weight of main panicle in grams.	Per plant in grams.	Remarks.
No. 79 (old strain for comparison).	5-9-1923.	4		3·99	11·71	Very early but coarse grained.
„ 184 ...	4-9-1923.	4·6	63·00	3·63	12·46	Very early, finer grained, higher yielding.
„ 164 (old strain for comparison).	28-9-1923.	6·	58·90	5·04	23·00	Intermediate.
„ 153 (do.)	28-9-1923.	8·61	72·75	4·18	23·40	Intermediate, tillering rather good and fine grains.
„ 17 ...	28-9-1923.	5·94	63·00	4·44	20·26	Medium to fine grained.
„ 42 (do.)	8-10-1923.	9·48	70·25	4·77	29·77	Good tillering, medium-fine grained, high yielding.
„ 32 (do.)	8-10-1923.	8·41	81·20	4·21	24·13	Rather good tillering, fine grained.
„ 202 ...	5-10-1923.	6·38	80·54	5·38	23·53	Fine grains, rather good panicle.
„ 199 ...	7-10-1923.	6·97	83·01	4·49	23·32	Fine grains.
„ 65 ...	6-10-1923.	6·44	82·37	4·74	22·16	Fine grains.
„ 39 ...	5-10-1923.	7·16	93·37	4·28	20·48	Very fine grains.
„ 82 ...	7-10-1923.	5·90	56·00	5·25	23·77	Coarse grains, rather good panicle.
„ 8 ...	4-10-1923.	6·06	51·20	5·29	22·31	Coarse grains, rather good panicle.
„ 136 ...	9-10-1923.	7·79	63·00	4·50	26·59	Medium-fine, grains rather good yield.
„ 37 (Patni).	10-10-1923.	4·02	46·60	7·67	23·13	Tillering poor grains very coarse, panicle heavy.

It will be seen from the above table that No. 39 is the finest of the whole lot but rather poor in yield. No. 184 is a very early strain with medium-fine grains ; it has given more yield than No. 79 in the intensive study culture and equal yield in the comparative culture. It is, therefore, worth trying again. Nos. 199, 202 and 65 are all late and as fine as Nos. 32 and 35 but their yield is lower than the latter strains. Nos. 82 and 8 are very coarse and late but not high in yield. No. 136 also is much coarser than Nos. 32 and 35 though it yields more than these. No. 37, the Patni sample, is poor in tillering but the weight of its main panicle is 7·67 grams being the highest of all the strains tried so far ; but unfortunately its yield per plant is not high.

New Panicles.—(*See* table on page 155). Out of the many new panicles brought by Mr. Bhalerao, the progeny of Nos. 219, 220, 221, 222, 223, 224, 225, 226 and 227 only were subjected to detailed study. These are all late in flowering. Of these, Nos. 222 and 225 showed bimodality in the weight of the main panicle and in the number of fertile tillers respectively. Otherwise all the numbers showed rather normal frequency distributions in the various characters. No. 223 is as fine as No. 35 and its yield also was slightly more than that of No. 42. It also yielded appreciably more straw than No. 42. So this number seems to be very promising, but further trials are desirable as unfortunately it had produced a totally sterile plant which probably indicates a bad contamination. No. 225 is also nearly as fine as No. 32 and yields appreciably higher than that strain. Besides it has also yielded much more straw than any culture in the intensive study series. Nos. 221, 222, 227 and 226 are all as fine as No. 32 and have given higher yields though not as high as Nos. 223 and 225. No. 219 is low in yield and coarse in grain size. No. 224 which appears to be impure has yielded much more than No. 32. It is, therefore, worth purifying if possible.

The following new panicles were not subjected to intensive study ; but an equal number of seedlings obtained from each of them were planted in two rows, the spacing given being 12″ × 6″. Compared under such conditions No. 240 of these is finer than No. 164 of the old lot and its yield also is higher than the latter. It matures about the same time as No. 164 ; it is, therefore, well worth trying again. Nos. 239 and 241 are as coarse as No. 164 but give more yield. The flowering period of these is also the same as of No. 164. Nos. 242, 243 and 244 though flowering at the same time are all finer than No. 164 and seem to give higher yields than it. Similarly the late ones Nos. 237, 228, 229 and 287 are much finer than No. 42 of the old lot or even than No. 35 and their yields are also higher. These, therefore, deserve to be tried again.

Among the new bulk samples there are some promising numbers. Some of these also possess fine grains and are intermediate in ripening. These together with some of the promising late samples deserve being studied for their general capacity next season. The

following table will show the comparative yields and other important characters of the new panicles taken up this year :—

Statement showing the Comparative Yields and other Important Characters of the new Panicles taken up this Year for intensive Study.

Panicle Nos.	Date of flowering.	Fertile tillers.	No. of grains per gram to show fineness.	Weight of mein in panicle grams.	Weight per in plant grams.	Remarks
No. 219 ...	10-10-1923...	9·21	64·20	4·82	22·80	Tillering good, medium-fine grained.
„ 220 ..	9-10-1923...	7·60	64·20	4·69	24·70	Medium-fine grained.
„ 221 ...	7-10-1923...	6·70	78·48	5·51	25·80	Fine grained.
„ 222 ...	7-10-1923...	6·80	78·93	6·06	27·09	Fine grained, yield rather good.
„ 223 ...	7-10-1923...	9·50	82·54	4·69	30·35	Tillering good, fine grained, yield good.
„ 225 ...	7-10-1923 ..	9·05	78·57	4·25	28·83	Tillering good, fine grained yield good.
„ 226 ...	7-10-1923...	7·75	83·25	4·85	28·33	Fine grained, yield good.
„ 227 ...	7-10-1923...	8·46	80·11	4·78	26·60	Fine grained, yield rather good.
Strain 42 (for comparison).	8-10-1923...	9·48	70·25	4·77	29·77	Tillering good, grains medium-fine, yield good.

Statement showing the promising bulk Samples.

Bulk No.	Period of growth.	Fineness.	Actual performance of the plant.		
			Tillers.	Yield grams.	Remarks.
7/6	Intermediate ...	Fine ...	11	33·0*	* If some of these plants turn out to be inherently high yielding and not merely responding to environmental conditions they might be worth having for propagating from.
10/2	Intermediate ...	Fine ...	7	27·8	
50/1d	Late ...	Medium ...	13	40·6*	
58/2	„ ...	Very fine ...	13	39·3*	
37/6	„ ...	Do. ...	12	37 5*	
42/2	„ ...	Med. fine ...	10	33·5*	
58/1	„ ...	Very fine ...	10	30·1*	
49/1	„ ...	Do. ...	11	29·10	
46/4	„ ...	Fine ...	11	29 20	
59/2	„ ...	Very fine ...	13	31·5*	
37/7	„ ...	Do. ...	7	21·4	
44/1	„ ...	Do. ...	9	22·5	
26/3	„ ...	Do. ...	9	23·2	

Hybridization Work.—So far the work was restricted only to the selection of desirable types and multiplication of the seeds of the most promising selections. There was, therefore, only a small chance so long of getting all round perfect types. It was, therefore, felt desirable to evolve types combining several desirable qualities. With this object in view some crosses were made (A) for the purpose of combining good tillering and heavy yield with very fine grain size and (B) for combining earliness, fineness and yield. The results of these are awaited.

Publication of the Results.—A leaflet giving the information about the improved strains has been issued for the benefit of the cultivators in the North Konkan and arrangements were made for the sale of seeds of the improved strains through the District Staff in the Thana and Kolaba Districts. A small memoir on the improvement of the Kolamba Rice in the North Konkan is ready for publication.

Extension of the Use of the improved Strains in the Kolamba Tract.—The improved strains are becoming popular and it is expected that during the coming season cultivators will grow them on some thing like 10,000 acres. Of these about 9,000 acres will be under No. 42 and about 500 acres under No. 79. It is also likely that about 500 acres will be grown with Nos. 153 and 164.

Lastly I wish to place on record my appreciation of the work of Mr. Bhalerao owing to whose transfer I have lost a very able and tactful Superintendent. At the same time I may say that Mr. G. G. Patil did very good work in Mr. Bhalerao's absence so that the new Superintendent, Mr. Hegdekatti, had little difficulty in working out the results.

Wheat.

Locality.—The work was carried on at the Ganeshkhind Botanical Gardens, Kirkee. Land was not available this year at the Poona Agricultural College Farm for the extensive cultures of the improved strains. But the seeds of some of our strains were distributed for trial to some of the Government Farms such as Dharwar, Jalgaon and Dohad, and on the fields of a few cultivators in Nasik and Prantij.

Staff.—Mr. N. M. Nitimargi, Agricultural Graduate in charge of the Wheat Breeding operations, was transferred to Surat for Cotton Physiological work in September 1923 and Mr. B. Nazareth, a fresh Agricultural Graduate, was taken in his place. Mr. Joglekar worked as non-graduate eldman.

Preparatory Tillage Operations.—These were carried on from May and onwards. In September there had been nearly 5 inches of rain from 10th to 29th. The sowing was commenced on the 11th of October 1923. A light irrigation was given about 10 days after sowing and another one on the 8th of December just before

flowering to all except the dry cultures mentioned later. During the growth of the crop no rain was received nor was any more irrigation given except to the Khapli selections whose resistance to rust we wished to test. To these cultures, however, as many as seven waterings had been given to provide optimum conditions for the appearance of rust. A number of seeds had not germinated for some days owing to lack of moisture. After the first watering some of them began to sprout. But some seedlings which had not got a good start eventually succumbed. Wilt also was responsible for some of the gaps which occurred later on.

Cultures under Study.—Fifteen strains including Pusa 4 which was used for comparison, were grown for further determination of their purity and yielding capacity on an extensive scale. Plant to plant measurements and notes on the important characters such as dates of flowering, height of the plant, number of tillers, length and breadth of the flag, size of the ear-heads, &c., and total weight of the whole culture were taken and the frequency distributions of these except the last were worked out together with their means, standard deviations, probable errors, &c. These were found to be satisfactory in many cases. Each culture occupied 6 rows planted a foot and a half apart. The seeds in the rows were dibbled in two's in each hole. This was done for preventing gaps and maintaining uniform conditions. But the improper germination due to lack of moisture and the death of some seedlings due to wilt frustrated the object to some extent. The dibbled cultures were grown in duplicate series. One of these was given only one watering and was observed as to its adaptability to drier conditions. The other was given two waterings. Each of the dibbled cultures contained from four to five hundred plants. A third series which may be called the repetition series was also grown for trial on an extensive scale. In this series all the strains were grown 6 times in 6 adjoining plots in such a way as to distribute the various strains equally in different soil conditions. This series was sown as if with a drill. Here each culture occupied four rows and an equal quantity of seed ($\frac{3}{4}$ oz.) per row was sown by hand as uniformly as possible for each of the six repetitions of a strain. The table of yields will show the plan of the repetition series and the yields of the various strains.

[Please *see* next page for Table.]

Statement showing the Plan of the Repetition Series and the Yields of the various Strains.

WEST SIDE.

C		B		A		D		E		F		Average yield per culture in oz.	Yield per acre in lbs.
Nos.	Yield in oz.	Nos.	Yield in oz.	Nos.	Yield in oz.	Nos.	Yield in oz.	Nos.	Yield in oz.	Nos.	Yield in oz.		
212	46·50		103·00	52	124·50	210	106·25	168	68·25	278	116·50	77·9	1,412
224	50·25	186	94·00	103	121·00	200	120·00	167	115·00	237	98·50	77·5	1,401
228	57·25	Pusa 4	80·00	162	120·25	Pusa 4	111·75	162	88·00	228	111·75	67·4	1,222
237	62·00	200	96·00	167	117·75	186	108·25	103	101·50	224	106·25	72·4	1,312
278	56·50	210	93·00	168	105·25	171	91·50	52	124·25	212	103·75	67·3	1,220
52	59·75	212	102·75	171	88·25	168	82·50	278	62·00	210	99·75	85·0	1,540
103	77·75	224	97·50	186	105·75	167	84·00	237	97·25	200	76·50	82·8	1,501
162	85·00	228	85·75	Pusa 4	93·25	162	69·75	228	67·50	Pusa 4	95·00	81·0	1,468
167	86·50	237	119·25	200	104·00	103	39·75	224	64·75	186	72·50	79·8	1,446
168	86·75	278	121·00	210	100·00	52	66·75	212	46·00	171	60·75	71·5	1,296
171	82·75	52	113·25	212	84·00	278	46·50	210	51·00	168	54·00	79·2	1,435
186	92·50	103	103·75	224	80·75	237	39·50	200	40·25	167	30·00	81·7	1,481
Pusa 4	87·00	162	77·25	228	55·25	228	26·75	Pusa 4	19·25	162	12·00	79·7	1,427
200	60·00	167	57·00	237	47·50	224	33·00	186	5·25	103	3·75	74·6	1,352
210	60·50	168	78·50	278	65·00	212	21·00	171	2·00	52	0·75	81·5	1,477

SOUTH SIDE.

NORTH SIDE.

EAST SIDE.

It will be seen from this that in every one of the six repetition plots three or four of the end cultures towards the east have given poor yields owing to the poverty of the soil. But taking things as they are, and averaging the yields of these six repetitions we see that at least nine out of the 14 strains compare well with Pusa 4. Of these four have actually given more yield and the other five though somewhat poorer are still quite comparable with it. On the other hand if we examine the yields obtained in a more even and normal looking plot, *viz.*, the B plot we find that nine strains have given more yield than Pusa 4 even if we raise the yield of Pusa 4 from 80, its actual yield here to 93 which it has given in other places.

Rust Resistance.—Conditions were not very favourable for the appearance of rust to any marked degree this year. Rust did appear here and there, but it did not affect our cultures to such an extent as to reduce their yields appreciably. Nos. 103, 162, 167, 186, 200, 228 and 278 had no rust at all. But Nos. 52, 168, 171, 210, 212, 224 and 237 were slightly affected. Nos. 168 and 171 were equally affected by alterneria also, both at Ganeshkhind Botanical Gardens and outside.

The series of the cultures that was maintained under practically dry conditions had absolutely no rust on any of the plants and

it is believed that on drier seed bed most of the strains would escape the rust attack.

The new Khapli strain which was given out last year as manifesting an extraordinary power to resist the attack of black rust was this year put under rigorous test. This culture was given seven waterings, and optimum moist conditions were maintained so as to encourage rust, and it was found that though the neighbouring cultures in the same plot, *viz.*, an extra culture of No. 168 and 100 foreign ones were very badly affected by rust yet the Khapli strain was practically immune. At the same time it must be mentioned that other strains of Khapli grown under similar moist conditions close by did show considerable amount of rust. The yield per plant of this resistant Khapli type is also good as will be seen from the table given below:—

Table showing the Comparison between the Yields per plant of Pusa 4 and the selected Strains.

Strain No.	1922-23.		1923-24.			
	Irrigated.		Irrigated.		Nearly dry.	
	Plants studied.	Yield per plant in grams.	Plants studied.	Yield per plant in grams.	Plants studied.	Yield per plant in grams.
No. 52 ...	230	12·01	362	**7·22**	492	**5·5**
„ 103 ...	257	12·46	453	**7·74**	446	3·6
„ 162 ...	259	10·83	458	**7·15**	482	4·7
„ 167 ...	260	11·09	507	6·12	517	6·1
„ 168 ...	265	8 01	458	7·01	603	2·9
„ 171 ...	285	5·88	429	6·85	500	3·3
„ 186 ...	275	9·67	432	**9·59**	534	**4·9**
„ 200 ...	268	10·11	383	9 02	418	2·8
„ 210 ...	268	6·12	452	**8·44**	477	3·5
„ 212 ...	229	7·37	465	7·00	493	4·7
„ 224 ...	275	8·78	364	**8·95**	508	4·7
„ 228 ...	265	11·51	442	6·50	500	4·7
„ 237 ...	239	12·29	500	6·70	540	**6·1**
„ 278 ...	244	15·49	252	6·66	368	4·3
Khapli ...	...	...	100	17·80	...	...
Pusa 4 ...	213	18·69	443	7 08	431	4·7

The multiplication of this pure and rust resistant type is being carried on and its distribution for trial on other farms will be arranged next year.

Last year owing to the appearance of rust at Ganeshkhind Botanical Gardens it was not possible to make good comparison of the yields per plant of the selected strains with that of Pusa 4 in the intensive study cultures. But as there was no rust this year, it was possible to make such a comparison. The above table gives the yield per plant obtained in the year 1922-23 and in 1923-24 in the different cultures. It may be noted that in 1922-23 only single seeds had been dibbled in a hole, whereas this year two seeds were

dibbled in a hole. So the larger number of seeds and the consequent crowding has naturally reduced the yield per plant. This year's figures will show clearly that seven of our strains are better in yield than Pusa 4 while two are nearly as good as that variety in the irrigated cultures, and in the dry cultures three are better while six are quite as good. It may be noted here that these strains are practically the same numbers that could be compared well with Pusa 4 in the repetition series. Similarly four of these numbers, *viz.*, 103, 162, 167 and 224 have done well outside Poona, *vide* statement showing the results of trial of the selected strains outside Poona. Our rust resistant Khapli strain also of which single seeds had been dibbled in a hole this year compares favourably with the last year's performance of Pusa 4.

One thing finally emerges out of these comparisons both in rice and wheat that, however, carefully we try to compare different strains with each other or with a standard it is not possible to get very accurate comparisons until the strains are grown alternately in several replications with the comparable standard owing to unavoidable soil differences. It is, therefore, intended from the next year to get these comparisons by this method. The results of such a comparison will doubtless be far more reliable than at present and it is hoped that several of our strains will turn out to be promising even under that test.

Attempts are being made to breed the rust resistance of Khapli and Pusa 4 into our high yielding strains. The following crosses were made with the object of combining rust resistance and high yield :—

No. 52 × Pusa 4,	14	flowers crossed.
Pusa 4 × No. 168,	41	flowers crossed.
No. 168 × Pusa 4,	28	flowers crossed.
Pusa 4 × No. 171,	28	flowers crossed.
No. 171 × Pusa 4,	36	flowers crossed.
Khapli × No. 168,	12	flowers crossed.
Total ...	159	

Besides these the following crosses were also made :—

Pusa 4 × No. 162,	24	flowers crossed.
No. 162 × Pusa 4,	17	flowers crossed.
Khapli × Pusa 4,	10	flowers crossed.
Total ...	51	

Trials of selected Strains outside Poona.—Six of our strains were sent to Dharwar, Nasik, Jalgaon, Dohad and Prantij for trial and comparison with the local varieties. It is encouraging to note the favourable results obtained in several cases.

Table of results—

Statement showing the results of trial of the selected strains outside Poona, in 1923-24.

Strain Nos.	Dry.						Irrigated.		Reclaimed from a tank soil and moisture good.	
	Dharwar.		Nasik.		Jalgaon.		Dohad.		Prantij.	
	Calculated yield per acre in lbs.	Remarks by local staff.	Calculated yield per acre in lbs.	Remarks by local staff.	Calculated yield per acre in lbs.	Remarks by local staff.	Calculated yield per acre in lbs.	Remarks by local staff.	Calculated yield per acre.	Remarks by local staff.
103	749	"All strains far superior to the local variety and No. 162 the best of all." The local strain is naturally very poor.	150	Nos. 103 and 162 preferred, the season unfavourable and hence the low yields in general.	512	No. 224 superior to local in all respects.	1,103	All the strains stand well in comparison to Baxi. But for want of one irrigation the yield somewhat fell short.	2,133	The other three strains were given to another cultivator who unfortunately mixed their yields at harvesting as they had some rust. But he preferred No. 224. The first man preferred No. 103 though its yield was less. As the local stain is sown mixed with Barley no figures could be obtained.
162	742		160		768		1,217		...	
167	661		105		832		1,146		1,520	
168	679		90		704		1,200		1,450	
171	665		90		672		905		...	
224	651		60		928		1,175		...	
Local 1	364		60		744		1,184		...	
„ 2	...		...		...		1,040		...	
„ 3	...		...		...		1,292		...	

It will be seen from this that Nos. 103, 162, 167 and 224 have done well at several places.

It will be seen from this that all the six strains tried at the Dharwar Farm proved quite sperior to the local Nos. 103 and 162 having topped the list.

At Nasik also these two strains behaved much better than the local though the season was most unfavourable to wheat.

At Jalgaon Nos. 224 and 167 proved superior to the local, No. 224 being superior to local in all respects.

At Dohad all strains could stand well in comparison with the local Baxi.

In conclusion I am glad to say that in the absence of Mr. N. M. Nitimargi, the experienced Superintendent of the Wheat Breeding Station, Mr. B. Nazareth could manage the wheat work efficiently with the help of Mr. G. H. Joglekar who has proved himself very energetic and useful.

R. K. BHIDE,
Plant Breeding Expert to the
Government of Bombay, Poona.

APPENDIX M.

Annual Report of the Plant Pathologist to Government of Bombay, Poona, for the Year 1923-24.

Staff.

Mr. S. L. Ajrekar, B.A. (Cantab. and Bombay), held charge of the post of Plant Pathologist to Government of Bombay, Poona, till the 27th January 1923, when his services were transferred to the Educational Department of the Bombay Government. The post since then has been filled by Mr. G. S. Kulkarni, M.Ag., and the section has been temporarily placed under the control of the Economic Botanist to Government of Bombay, Poona, pending the reversion of either Mr. Ajrekar or Mr. G. S. Kulkarni to this section.

Mr. G. S. Kulkarni's services were lent to the Indian Cotton Committee for cotton wilt investigation work from 8th September 1923 and the post of Assistant Professor has since been kept vacant.

Mr. M. N. Kamat, B.Ag., Assistant Mycologist, was elevated to the temporary post of lecturer in Mycology from the 12th November 1923 and has been holding charge of the post since then.

Mr. J. D. Randive, B.Ag., was appointed to act as Assistant Mycologist from the date Mr. Kamat vacated the post.

Research.

Owing to the absence of both the Plant Pathologist and the Assistant Professor of Mycology, little work could be turned out this year; the other staff was largely occupied with teaching duties at the College of Agriculture, Poona.

Experiments to test the resistance to the two Common Smuts (S. sorghi and S. cruenta) of the various jowar varieties were carried out and the results have revealed certain varities of Milo to be perfectly immune.

Dwarf Milo, Standard Milo, Spur Feterita and White Milo have remained absolutely free from the smuts, the other varieties showing a percentage of smut attack varying from 15 to 100. The following table shows the details of the experiment :—

Serial No.	Name of variety.	Infected with	No. of sound heads.	No. of smutted heads.	Percentage of attack.
		Resistant.			
1	Dwarf milo ...	Sphacelotheca sorghi ...	All.	Nil.	0
2	Standard milo ...	"	"	"	0
3	Feterita ...	"	370	1	0·2
4	Spur Feterita ...	"	All.	Nil.	0
5	White milo ...	2	A	Nil.	0

Serial No.	Name of variety.	Infected with	No. of sound heads.	No. of smutted heads.	Percentage of attack.
		Resistant—contd.			
6	Dwarf milo ...	Sphacelotheca cruenta.	All.	Nil.	0
7	Standard milo ...	,,	All.	Nil.	0
8	Feterita ...	,,	325	1	0·3
9	Spur Feterita ...	,,	All.	Nil.	0
10	White milo ...	,,	A	Nil.	0
		Susceptible.			
11	Sun rise Kafir ...	Sphacelotheca cruenta.	240	5	2·4
12	Black hull Kafir ...	,,	180	9	5·0
13	Red Kafir ...	,,	307	48	15·6
14	Dawn Kafir ...	,,	225	68	30·2
15	Shalu ...	,,	178	103	57·8
16	Sun rise Kafir ...	Spacelotheca sorgi ...	205	21	10·2
17	Black hull Kafir ...	,,	180	40	22·2
18	Red Kafir ...	,,	165	166	100·6
19	Dawn Kafir ...	,,	216	148	68·5
20	Shalu ...	,,	140	102	72·8

The seed collected from the immune varieties has been sent to the Superintendent, Surat Farm, for varietal trial there and to the Superintendent, Sukkur Farm, Sind, for further trial regarding its immunity to the two common smuts.

It may be noted, in this connection, that these immune varieties grew well here and gave good outturn.

Potato Wilt.—This work is being carried out under the control of the Potato Committee. Certain strains of Fusariuim have been isolated from wilted plants and their morphology and pathology are being studied. So far, no evidence of parasitism has been obtained though wounded potato tubers are easily attacked by the Fusaria. The work requires a large amount of observations both in fields and laboratory and a detailed study of the organisms associated with such wilts; unfortunately it has not been possible to devote as much time to this work as is warranted by the importance of the subject owing to inadequate staff.

Mango Blight.—Spraying trials were carried out against Mango blight (Erysiphe cichoraceum) in Ganeshkhind Botanical Gardens, Kirkee. Fifty plants were treated. The mixture used was a combined spray (Bordeaux mixture plus 1 per cent. Rosin Soap) effective against both the insects and the mildew which are, in many cases, associated; unfortunately, the blossoms were few and the mildew, also, was scanty, so that the trials have remained inconclusive this year; these will be repeated next season.

Leaf Blight of Hariali (Cynodon Dactyon.)—A species of Acrothecium has been isolated from leaves of Cynodon dactyeon. It is being studied and the experiments carried out so far, though not quite conclusive, indicate its possible parasitism. It is likely that it may attack cultivated grasses also and hence its importance.

New Diseases.—It was interesting to observe a few smutted heads of Bajri (*Tolyposporium penniciliare*) in the experimental plots at the College Farm. The smut was till now considered to be absent from the Deccan and confined to Gujarat only; on enquiry, it was learnt that the seed was bought locally.

A species of *Aspergillus* was isolated from a large number of mango fruits, some wounded and others apparently sound but with a rot in the interior. The fungus is under study.

A species of Diplodia has been isolated from a wilted betel-vine specimen sent to this office for report from Dharwar District. This fungus was not previously known to attack this crop.

Teaching.

Courses in compulsory as well as Optional Plant Pathology were given to students at the Poona Agricultural College.

Routine Work.

The total number of specimens received in this office and identified were 81; a great many Bor fruits (Ziziphus jujuba) were received which showed an attack of a powdery mildew; the damage was reported to be severe; owing to inadequate staff, it was not possible to visit the affected area and try any treatment.

Mr. Randive, acting Assistant Mycologist, visited the Jalgaon Agricultural Exhibition held in December 1923, and gave practical demonstrations of spraying and the various fungoid diseases of crops.

Demonstrations were also arranged for the public, specially the delegates for the Co-operative Conference held in Poona in September 1923 and at the Indian Industrial Exhibition, held in May 1924 on the Poona Deccan Gymkhana grounds.

APPENDIX N.

Annual Report of the Work done by the Soil-Physicist to the Government of Bombay, Government Farm, Manjri, from June 1923 to June 1924.

The work of my branch which was so long divided into two sections, *viz.*, Research and Teaching is now being concentrated on research alone. Help is, however, given as usual to other branches of the Department as well as to the public regarding problems of soils.

These problems relate mainly to the physical texture of the soil including water logging conditions and salt incrustation and investigation of the colloidal material of the soil. A noteworthy problem which has been referred to me for investigation is to find out if the disease "sugarcane borer" does not spread more rapidly as the temperature of the soil rises higher and higher. If time would permit, the problem may be taken in hand in near future. Conservation of moisture during intervals of irrigation may play an important part in lowering the soil temperature and consequently in checking the disease if the theory is right.

Dry Farming.

As related in my last year's report research work in my branch is so directed that it may be ultimately useful in keeping down, as far as possible, famine in food grains and fodder in districts of scanty rainfall, in other words investigations into the existing methods of dry farming, practised here as well as abroad, must be carried out and if possible new methods evolved to suit the requirements of a particular crop in areas having a low and precarious rainfall. The carrying out of such an investigation requires close association with other branches of research, *viz.*, soil chemistry, botany including plant breeding, &c., and it was thought that the investigation into the methods of dry farming would be more conveniently carried out near the Central Institute of agricultural investigations, *viz.*, the Agricultural College, Poona. Such a place was found at Manjri which is not far away from Poona and is situated on the border of dry tract where the rainfall is little and which could afford facility for such kind of work at a considerably much less expense to Government. A couple of buildings and ample land for dry farm investigations were available and a suitable piece of land was selected after a thorough trial to see that no water of percolation from any irrigated tract round about the place moistened the sub-soil. Trial pits to a depth of eight feet were taken in the piece of land selected and the pits allowed to remain open for over eight days. It was found that the pits were dry and remained perfectly dry during all that time. As the land is situated at a higher level it is not likely that water would percolate into the area selected.

In order to see if Manjri, which is an irrigated tract, is at all suitable for dry farm investigation, a comparison of its climatic condition was made with such dry tract as Nagar and Sholapur, which are known as tracts of scanty rainfall. The following table shows such a comparison for the last 20 years for Poona, Manjri, Nagar and Sholapur, the figures being for rainfall and humidity for several periods, each period representing an average of five years :—

Rainfall.

	1908-12.	1913-17.	1918-22.
Poona ...	24·19	31·74	26·79
Manjri ...	20·64	25·33	17·55
Nagar ...	21·46	28·61	18·36
Sholapur ...	25·42	30·94	21·28

Humidity.

	1908-12	1913-17	1918-22
Poona ...	...	40, April	40, April
Do. ...	...	83, August	83, August
Manjri ...	...	48, April	45, March
Do. ...	...	86, August	84, August
Nagar ...	...	55, March	46 March and April
Do. ...	...	80, August and September	80, August and September
Sholapur ...	...	33, March	33, March
Do. ...	...	77, September	77, September

It will be seen from the above table that out of all the four places shown in the table, *viz.*, Poona, Manjri, Nagar and Sholapur, Manjri has the least rainfall and is not, therefore, such an undesirable place for dry farming as it would at first appear on account of the irrigation in the near vicinity. If we compare the figures of humidity it will be seen that humidity at Manjri in rainy season in August is higher than that at Nagar and much more so than the humidity at Sholapur. During summer, however, in the month of March humidity at Manjri is lower than that at Nagar.

A piece of land about 5 acres in the Kuran land at Manjri was, therefore, selected and the Professor of Agriculture in whose charge it was, was requested to spare it for the purpose of dry farm experiments and he was good enough to hand it over to me. The land was then cleared of the jungle and deeper roots of big babhul trees were dug out by hand and a fairly level piece of about an acre of land prepared for experiments on bajri and tur during the Kharip season. For Rabi season jowar would be taken. As the land is likely to sink unevenly this season and the results of this season are likely to vary a good deal, field experiments will also be repeated in prepared pots where the effect of sinking would be uniform in all the pots.

During the year under report a severe trial was given to Mason's pencil method of determining the water delivering power of the soil. A suitable desiccator was specially devised and all the precautions taken to protect the pencils from the outer atmosphere but in spite of all the precautions taken no two results would closely agree. The matter was then referred to Dr. Livingston of America who was the originator of the soil-point method and who had suggested the use of the pencils instead of the porcelain soil-points. In reply he wrote that the method was not very accurate if an average of two experiments was taken but an average of ten determinations gave fairly accurate results for purpose of filed and pot-experiments. This work was specially undertaken by me on behalf of the committee of Bajri Research work of which I am one of the members.

The use of "atmometer" which determines the evaporating power of the atmosphere is of great importance in the investigation of dry farming experiments, and in any kind of work on drought-resisting plants. A few atmometers were kindly supplied to me by Dr. Burns and I have been able to modify the method of using the atmometers in such a way that the accuracy of reading could be brought to as close as 0·1 c.c. which was not quite possible in the method used before.

Staff.

Mr. G. M. Bapat, M.Ag., who joined me in the month of October 1923 as a graduate fieldman, has done all the work entrusted to him with great diligence and interest. Mr. G. R. Yadao, who worked under me as a non-graduate fieldman from July to March passed the examination for the Degree of Bachelor of Agriculture and left me for higher appointment in the month of May.

Head Quarters and Accommodations at Manjri.

My Head quarters were transferred from Poona to Manjri on the 15th of May 1924. My laboratory and office have been located on the Government Manjri Farm in one of the two buildings which was built for the purpose of holding sugarcane class and I have been given for my residential quarters the remaining building which was intended as the kitchen and dining hall for the boys who came to study in the sugarcane class.

There is, however, great inconvenience caused for want of accommodation to other members of my staff especially the graduate and the non-graduate fieldmen. Some permanent arrangement of quarters, which will go a great way in keeping the staff contented, is necessary.

V. A. TAMHANE,

Soil Physicist to the Government of Bombay,

Manjri.

APPENDIX O.

Summary of Work done by the Deputy Director of Agriculture for Animal Breeding, for the year 1923-24.

Mr. E. J. Bruen remained in charge of the duties of the Deputy Director of Agriculture for Animal Breeding till the 25th April 1924 after which he has been appointed officiating Imperial Dairy Expert, Bangalore and I have taken over the charge of his duties from 25th April 1924 onwards. He toured through the Presidency giving advice to private persons and Dairy Farms whenever he was called upon to do so. The Kandivali and Mulund schemes have been brought into operation and it is hoped that much useful work will be achieved through these institutions. Still negotiations are going on to co-operate with Pandharpur Gowrakshak to take up breeding of the Khillari and it is hoped that a scheme thereon will be submitted very shortly.

It is encouraging to note that people have begun to realise the benefits and now some farmers having a big herd as well as small farmers and others having few animals in village are taking real interest in joining together and asking for a good breeding bull on a Premium System. They have found to their advantage that the young stock has come out decidedly superior by having a good bull from the Department. Yet it might be remembered that we are simply buying the bull at the show and have no pedigree bulls to offer. However, if we can get somebody to take up breeding of pedigree bulls for supplying Premium Bulls the effect of such bulls will be very great and certain on the future stock.

It was arranged to hold five Shows in the Presidency including Sind, but only three Shows at Chharodi, Mahud Bk. and Athni were held and it is now needless to mention that all these were very successful. The Show at Bankapur could not be held on account of partial famine and that of Karachi had to be dropped as there was a serious attack of Rinderpest prevailing in and round about Karachi.

In addition to the existing farms for the three breeds Kankrej, Amrit Mahal and Sindhi, Government have now subsidised the Shirpur Agricultural Association Farm for the Tapti Khillari breed and the Kandivali and Mulund for the Gir breed and we have already put trained Managers at the latter two places and it is hoped that within few years some such farms for the remaining breeds also will be subsidised to undertake scientific breeding for the local breeds.

The demand for bulls is growing very rapidly and it is discouraging that all the wants could not be fulfilled for the scarcity of good bulls in the Central and Southern Divisions. Many of our breeds of cows are kept only for one purpose and though there is good market at a paying price for good male stock, there is no

demand for heifers and this handicaps the breeder a lot from economic points of view. Besides the farmer with his sentiments for cows is unable to dispose of his surplus heifer stock and thus he has to keep more animals than he needs or he can properly feed. I have observed that the bull calves are invariably well fed after they are born but the mothers carrying them for nine months and suckling them afterwards get very poor feeding. I believe there will be no market for cows as long as they are not economical to keep for milk production and as long as a taste and love of cow's milk is not created amongst people. So, as long as the question of breeding up a strain of breed that can give milk as well draft animals is not tackled properly, I see very little chance of better feeding and care of cows.

In this work the ideas of superficial points of colours and shape do interfere in securing good milking strain and I believe unless the Department takes a lead of creating new ideas of the types of animals that can produce milk and work cattle, all the economic difficulties will remain where they are. I agree that there is some risk in this but one has to take some risk to achieve something worth achieving.

The experiments of intensive handling of young stock milking and keeping records with Kankrej breed is carried out with the stock on the Chharodi Farm.

Unfortunately no such experiment has been started with Amrit Mahal breed at Bankapur yet for want of housing and other arrangements, however, it is decided lately to begin work though on a small scale with the means available.

The Sindhi Farm deals with a milch type of breed and I am glad to note that we have purchased a cow that has given over 10,000 lbs. of milk in one lactation and fortunately she has a bull calf. I have also purchased her heifer just recently. I believe, we ought to get the best milking animals true to type from anywhere at any cost and then work with them by keeping records and see if we can get any one of them turning out to be good breeder. I doubt, if we work only with ordinary material, we will ever get a chance of finding a fortunate animal valuable for breeding for milk production.

I wish to make a note of the special difficulty of getting men specially trained as cattle and Dairy Managers who can be available at a pay of Rs. 60 to Rs. 100 per month.

The private Farms like Shirpur and Gangapuri Farms and few others find great difficulty in getting a trained Manager within their means and if we are to extend our operations, we ought to take up the work of training such men at once at the College Dairy with a special two years' course in Practical Dairy, &c., and I believe this can be taken up with small addition of staff without waiting for a fully equipped Dairy School. Local men can then be trained up to be put out when needed.

The work of the Deputy Director is divided as follows :—

(*i*) Production of bulls and Experimental work on Stud Farms.

(*ii*) Propaganda and Village Improvement.

NORTHCOTE CATTLE FARM, CHHARODI.

Mr M. M. Desai held charge of the Farm till 7th January and Mr. V. G. Desai, B.Ag., a Graduate Fieldman in charge of Surat Dairy, was appointed to act in his place. Mr. M. M. Desai has been apppointed to act as Assistant Professor of Animal Husbundry in the Agricultural College, Poona. Mr. M. G. Patel worked as Assistant throughout the year. All the staff have worked well.

Season.

The monsoon was very late and irregular. Rain started on July 3rd giving 2 inches and 33 cents in that month ; August rain was 5 inches and 54 cents ; September rain was only 49 cents ; the total being 12 inches in 22 rainy days as against a rainfall of 23 inches and 21 cents in 32 days during the previous year. The rainfall was not uniform all over the Farm area, one of the best grass plot of about 400 acres being left out without any material rain.

Crops.

Hay.—The hay crop was below average. The low-lying areas where the grass used to be spoilt gave a fairly good grazing owing to the scanty rainfall and thus helped the situation to a certain extent. In spite of the bad season, the Farm did support some 1,500 cattle of outside people by allowing them to graze on the inferior variety of grasses during the latter part of the year. The total hay harvested during the year was 209,457 lbs. and the cost of production including stacking comes to Rs. 5-3-7 per 1,000 lbs. The cost is rather high as the grass was poor in growth.

In addition to hay crop the other fodder crops yielded as under:—

Sholapuri yielded 2,505 lbs. dry.

Sundhia yielded 3,300 lbs. dry calculated as 40 per cent. of green yield.

Local jowar yielded 3,500 lbs. dry calculated as 40 per cent. of green yield.

As the season was bad, we got no grain.

The Sunflower was sown on 1 acre and the yield was 7,217 lbs. green.

Most of the fodder was put into silos as green stuff, the grass being too poor for silage. The total amount of jowar put into silo was 175,899 lbs.

The quantity of Sunflower was too small to put into separate pit and, therefore, it was mixed with jowar. The mixed silage, however got de-composed, may be due to hollowness of the stem of Sunflower.

Livestock.

The following table shows the strength of livestock on the 30th June 1924 :—

Serial No.	Name of Species.	No. of animals.	Remarks.
1	Cows adult ...	206	
2	Breeding Bulls ...	7	
3	Heifers ...	49	
4	Young Bulls ...	22	
5	Male calves ...	57	
6	Female calves ...	97	
7	Working bullocks ...	46	
8	Castrated stock ...	17	
	Total ...	501	

The breeding of the Kankrej herd on the Farm was continued on the same lines as reported in previous years. The tying of milch cows and young stock is continued and cows are milked and a record is kept; this will enable us in course of time to select a milking strain of Kankrej.

If we are to achieve good results in milk yield, the cattle ought to be more intensively handled and fed but the want of proper sheds and the sufficient budget for concentrates do not permit this. It is hoped this will be soon provided as soon as the policy of the Cattle Breeding Department is settled.

There is an increase in the number of milking animals over the last year but there being only few animals under study for second lactation period no data of use can be given yet.

Diseases.

The Farm having surrounded by a number of villages is apt to be visited by some sort of epizootic and the Farm herd being not quite trained gives much trouble for treatment or for milking. During the year under report, there was an attack of Foot and Mouth Disease in the month of December but preventive measures, such as

segregation, &c., were soon taken up and the disease soon disappeared. Rinderpest had made its appearance in some villages round about but fortunately the Farm had no trouble from that drastic disease. The total number of deaths recorded during the year was 29 due to debility, old age, some disease and venominous bites, &c.

The total number of births is 92 as against 66 of last year.

During the year 11 cow bulls and three buffalo bulls were put out on Premium System; the number is smaller compared with last year due to famine condition in the districts. Forty-nine old and other undesirable animals were cast and sold for Rs. 1,333.

If funds could be made available, the Farm area could be divided up into paddocks and a great deal higher yield of grass as hay and grazing could be obtained. As far as funds permit the area infested with shrubs and trees is cleared up and divided into plots.

General.

The cattle are in very good condition in spite of the scarcity of rain and the Manager, Mr. V. G. Desai, deserves the credit.

CATTLE BREEDING FARM, BANKAPUR.

Mr. A. B. Gadagkar was in charge of the Farm throughout the year.

Season.

The antimonsoon rains made a very promising beginning; the proper monsoon started a bit later, *i.e.*, in the last week of June and was quite good and opportune up to the middle of September after which there was no rain which resulted in the partial famine of fodder as the growth of both grain and standing crops was checked. It was really a very difficult task to secure kadbi for the Farm animals as there was a general failure of fodder crops owing to the scanty rains.

Andropogon Contortus or spear grass grows abundantly and owing to the sudden stoppage of rain in the middle of September, the operation of removing and collecting the spears with the aid of the comb was very successful.

The harvesting of grass by mowers has proved a failure on this Farm as most of the land is undulating and hence the whole area had to be cut by hand. The total area was divided into two plots, *i.e.*, for grazing and for cutting grass for hay and silage. The total quantity of grass cut was 215,400 lbs. at a cost of Rs. 440 as against 240,000 at a cost of Rs. 667-10-3 of last year. 97,000 lbs. were turned into silage. The yield of grass was not sufficient to last throughout the year and no kadbi was available to supplement it. Arrangements had to be made with the Forest Department for grass and 89,000 lbs. of grass was cut and carted at a cost of Rs. 696-4-0 from the forest. The cost of stacking of the whole lot came to Rs. 165.

Livestock.

The following table shows the strength of livestock on the 30th June 1924:—

Serial No.	Names of species.	Number of animals.	Remarks.
1	Cows adult ...	48	
2	Breeding Bulls ...	3	
3	Heifers ...	21	
4	Young Bulls ...	17	
5	Male calves ...	7	
6	Female calves ..	23	
7	Working bullocks ...	6	
	Total ...	125	

The above statement shows that the strength has reached to its maximum but the grass area is too small for the herd and if we wish to demonstrate better breeding and better care, we ought to have some grazing area. In fact the Government Farms ought to have at least 6 months fodder storage.

The herd on the whole has done well and shows very promising results from breeding point of view. The most striking point that can be cited is that three of the heifers bred on the Farm came to maturity when they were below 2½ years. This is really a satisfactory result and by this we have attained one of our aims for which the Farm exists.

Thirty-two cattle not true to type and others were sold by auction for Rs. 1,894.

Disease.

During the year Foot and Mouth Disease made its appearance in January but the spread of the disease was checked by the timely preventive measures adopted but at the close of the year under report a disease called " Black Quarter " appeared on the Farm on 7th June and within a fortnight or so 6 animals succumbed to this disease. As there was no curative treatment for the diseased ones nor any measures could be taken for the healthy ones, the only remedy resorted to was segregation. Accordingly the whole herd was removed to an area about 8 miles from the Farm and quite secluded from the villages round about.

The total casualties during the year were 13 in all.

During the year three Premium Bulls were put out from the Farm. The demand is increasing rapidly but the Farm being still in its infancy cannot meet all the demands but it is hoped that in fewy ears most of the needs will be met.

The Farm has only one pucca building and the accommodation is very limited.

Fodder Crops.

An area of about $1\frac{3}{4}$ acres was under "Sunflower" and the yield was 16,328 lbs. of green feed.

Also an area of about 1 acre and 29 gunthas was under jowar fodder and the yield was 5,200 lbs.

Both of these were put into silos.

General.

During the year 7 outside cows have been covered and in all cases the services were successful. No Cattle Show was held on the Farm this year as there was a partial famine prevailing round about the Farm. The livestock was in good condition when I visited the Farm in May.

Mr. Gadagkar's work was quite good in spite of his having no assistant.

WILLINGDON CATTLE FARM, PHIHAI.

Mr. B. B. Jamaspjina was Manager of the Farm throughout the year.

Season.

The tract is particularly devoid of rain and people round about depend upon well irrigation and power pumps. The average rainfall is 5" and the year under report was bad as there was less than three inches of rain-fall within three consecutive days in August. The grazing is usually good in spite of scarcity of rain and the cattle got good grazing available even after the hay-making, the winter rain helping the sprouting of grass.

Hay-making.

During the year 66,000 lbs. of grass was cut, half of which was given in lieu of cutting charges for want of enough grant. At the beginning of the year, the Farm had only two or three acres of cultivation but during the year under report about ten acres have been broken and various crops were grown and fed to cattle.

Among the crops grown were Jowar, Bajri, Maize, Sunflower, Oats, Berseem and Wheat. A large portion of the area was cleared of "Kundu bush" and a road was constructed from the fencing gate to the cattle byre, &c. This Farm has been fitted up with a crude oil engine of 20 B. H. P. and the water supply is copious and gave a constant supply of water without any trouble.

In November the Landhi Farm was amalgamated and much use of it was made by sowing Berseem and Oats; thus green fodder is supplied to the cattle in the most trying months.

There are no quarters for labourers and the want is badly felt for six quarters to have efficient management of work on Dairy Farm.

Livestock.

The following table shows the strength of livestock on the 30th June 1924:—

Serial No.	Names of Species.	No. of animals.	Remarks.
1	Cows adult ...	38	
2	Breeding Bulls ...	4	
3	Heifers ...	4	
4	Young Bulls ...	6	
5	Male calves ...	20	
6	Female calves ...	11	
7	Working bullocks ...	2	
8	Tigris ewes ...	2	
9	Donkey ...	1	
	Total ...	88	

The herd has some of the finest recorded specimen of the breed and is being added by purchasing only selected specimen available in the locality. The chief defect of Sindhi animals, *viz.*, pendulous udders and bunched up teats are particularly avoided by selection.

Out of 34 cows in lactation during the year some 15 cows gave over 4,000 lbs. and some 8 cows over 5,000 lbs. of milk per lactation. One cow, a newly purchased animal, is an invaluable asset of the Farm. She can be called the only cow of her kind giving an average of over 10,000 lbs. in a lactation and her male calf that came with her is certainly priceless. The milk record of some of the highest yielding animals has been given as per statement attached.

Milk Disposal.

The farm is situated 13 miles away from Karachi, the market for milk and we have to cross the river on the road. The milk is taken on camel and there is lot of trouble in transit and the Farm being not equipped with pasteurizer the very valuable milk is not fully utilised. The wholesale rate of milk ranged from Rs. 4-8-0, to Rs. 5-0-0, per maund of 92 lbs. and it went to Rs. 9, only in November. To the best advantage we have to sell the milk to a contractor at Rs. 4-8-0 per 92 lbs. on the spot who takes all the risk of transport. Pasteurizer may prove a good asset in supplying the pure milk direct to the public bodies in Karachi.

General.

The result of breeding found among Farm bred animals has been satisfactory. Among the heifers bred from the herd and that were in milk, five have made a total of over 4,000 lbs. per lactation. The bulls Rupo, Shaikh and Tanwar which generally headed the herd have thrown out very good progeny.

During the year there were 35 calvings of which 21 were males and 14 females. There were four deaths of which one was of a cow.

Rinderpest prevailed for a long time in the district but fortunately the Farm was quite safe. Six heads of cattle and two sheep were sold during the year and the realizations were Rs. 1,300.

Propaganda and Village Improvement.

The work has been assigned to three persons named as Divisional Inspectors of Cattle Breeding, Northern, Central and Southern Divisions. This year also several villages in all the Divisions were visited by the Divisional Inspectors and advice on the importance of having breeding bulls, better feeding and care was given and their ultimate effect on the progeny and through them on agriculture was pointed out. Premium Bulls were distributed but the amount sanctioned, *i.e.*, Rs. 2,500 proved to be very inadequate to the demand and we had to refuse applications for want of funds.

The following bulls were given out on Premium System :—

Northern Division	...	3 Dangi, 1 Kankrej, 1 Tapti Khillari and 3 Buffalo bulls.
Central ,,	...	3 Maswad Khillari.
Southern ,,	...	5 Amrit Mahal
		and
		2 Merino rams.

Cattle Shows.

This year out of the five Shows proposed to be held only three could be held, *i.e.*, for Kankrej at Chharodi, for Maswad Khillari at Mahud Bk., and for Krishna Valley at Athni. At all these Shows there was good attendance of cattle and the agriculturists.

Rs. 417 were spent for prizes at Chharodi Show.

„ 427 „ „ Mahud Bk. Show.

„ 277 „ „ Athni Show.

Rao Saheb Mangsoli deserves credit for the success of the Athni Show.

The other two, *viz.*, for Sindhi breed at Karachi and Amrit Mahal breed at Bankapur could not be held as there was Rinderpest prevailing in the district and round about Karachi and as there was partial famine in the Bankapur Taluka and round about.

Along with this Show a demonstration of silo-making and the use of Burdizzo's Castrator was shown and its benefits over the country method were explained. The cultivators were much impressed with this demonstration and it is hoped that they will resort to this silage-making as it is very beneficial especially in such parts where fodder is very dear.

General.

Staff.—All the staff have worked well during the year. The Head Clerk, Mr. V. K. Gokhale, has in fact to play the part of the Personal Assistant for the good deal of the office work.

B. S. PATEL,

Ag. Deputy Director of Agriculture
for Animal Breeding.

A Statement showing the Milk Record of some of the highest yielding animals on the Willingdon Cattle Farm, Phihai.

Serial No.	Name.	Milk yield.	No. of days in milk.	Average per day.	Age, years.	Remarks.
		Lbs.		Lbs.		
1	Iris No. 98 ...	7,749¾	278	28	6½	Third calf.
2	Mandhir No. 66 ...	5,890½	395	14¾	3½	First calf.
3	Matari No. 22 ...	5,647¼	373	15	5½	Farm bred; first calf.
4	Lakhi No. 65 ...	5,484¼	271	20·2	8	Third calf.
5	Ganga No. 2 ...	5,232¼	319	16½	6½	Second calf.
6	Mochari No. 24 ...	5,152¼	393	13	5½	Farm bred; first calf.
7	Tulip No. 85 ...	5,122¾	356	14¼	6½	Second calf.
8	Karachi No. 3 ...	5,014¼	304	16½	11	Fifth calf.
9	Sugni No. 32 ...	4,944½	343	14¼	5	Farm bred; first calf.
10	Irravadi No. 5 ...	4,779½	272	17½	8	Third calf.

B. S. PATEL,

Ag. Deputy Director of Agriculture for Animal Breeding.

APPENDIX P.

Annual Report of the Agricultural Engineer to Government, for 1923-24.

I held the charge of the office of the Agricultural Engineer to Bombay Government during the year under report.

The activities of the Department were not solely devoted to advisory and research work as anticipated last year as there was a considerable increase in the executive which took up most of the time of the staff and consequently the research work in connection with the modification of implements and agricultural machinery, the survey of pumping sites on rivers for famine purposes and periodical inspection of agricultural machinery belonging to the Department has suffered. In the circumstances I was unable to visit Sind during the year and continue my investigations of last year.

The work actually done is summarised in brief as under.

Modifications of Machines.—A locally made Winnower from the Jalgaon Farm sent by the Deputy Director of Agriculture for various improvements, has been taken in hand in order to reduce the driving power required, replace the tooth wheel gearing with a better and more efficient substitute, rearrange the shaking of the riddles and reduce the terrible noise now produced to a minimum. The tooth gear has been entirely done away with and a roller chain gearing having a $\frac{3}{4}$" pitch with necessary sprockets, bearings and a new shaft have been substituted to reduce the friction and the power to a minimum. The fan spindle bearings have been replaced with temporary roller bearings made at the shops and the spindle machined wherever necessary together with the bearings of main driving shaft.

The riddle arrangement is in progress and it is expected to be completed for a final test within a couple of months time. There has been also a great necessity of a suitable seed drill box for sowing jowar. A box suitable for the purpose has been newly made is under test for further modifications.

Resource in case of Breakdown.—The Crusher at Manjri broke down during the crushing season which took up much time to put it in working order. While it was under repairs a combined cane crushing plant consisting of a 15 B. H. P. Blackstone Crude Oil Engine and a No. 92 Chattanooga cane crusher had to be temporarily removed to Manjri, fixed and run there until the farm crusher was repaired.

Mr. S. V. Supnekar who has had a pumping installation set up on the river Koyna at Supna, District Satara, through this Department approached us for help at the eleventh hour to put his engine right and save his crops. On inspection it was found that the engine

required considerable repairs which were not possible in so short a time. A suitable engine had to be, therefore, sent to him on hire and fixed at his site to save the situation.

Mr. M. B. Mohite of Retra also came with the same difficulty when the cylinder of his engine cracked, rendering the engine useless for work until it was replaced. A noria had to be sent to him on hire to save his crops until his engine was put right.

Mr. Kuber of Dahivadi also felf in the same plight when his engine broke down which had to be substituted with one of the Famine sets in order to save his crops, until his engine was thoroughly repaired and erected on a new foundation.

Advisory.—Owing to the failure of rains the number of enquiries for pumping, crushing and other agricultural machines has fallen considerably. Out of 107 enquiries, 12 were for power pumping, 49 for boring, 2 for cane crushing, 10 for motor ploughing. 62 for admission in the oil engine class and 12 for general work. Of the pumping enquiries 2 were of a very complicated nature requiring heavy initial outlay, and consequently Messrs. Walchand & Co., of Bombay, promoter of one of them, had to give up the idea for the present as it was not a feasible proposition. Mr. Narrottam Morarji, promoter of the 2nd, is likely to go in for a plant but nothing has yet been heard from him definitely. One of the enquiry from Sindh from the Court of Wards has recently matured and I have at present in hand working drawings for the installation in question.

The Chharodi Government Farm was for a long time badly in need of a power plant for supplying water to the cattle as there was always a scarcity and difficulty of good drinking water in the whole area during hot weather. A couple of bores were specially taken in the well close to the office and bunglow for a copious supply of fresh water and the well near the office was found to be more convenient and possessing several facilities for a power plant. Accordingly plans for a suitable power plant capable of delivering water to the several byres through an elevated tank were made, the plant purchased and erected.

There are also some machines such as, Ensilage Cutter, Grinding Mill, Engine, Countershaft, &c., to be fixed on the Bankapur Farm and this work has been taken in hand with the help of the mechanical assistant from the Southern Division.

Two combined self contained cane crushing plants, one consisting of a 6 B. H. P. Blackstone oil engine and No. 44 Chhattanooga Crusher, and another of a 15 B. H. P. Blackstone Crude Oil Engine and No. 92 Chhattanooga cane crusher, complete with juce pump, magasee carrier, &c., mounted on a special girder frame, requiring no foundation have been worked for the Southern Cental Division, during the crushing season as per Government, G. R., R. D., No. 5122 of 30th November 1922 issued on the recommendations of the Sugarcane Committee. The plants, however, are found to be too small in

size as they do not deal with one ton of cane individually per hour. Bigger units have, therefore, to be recommended and if their purchase is sanctioned we shall be able to obtain more valuable data regarding crushing of cane.

The trials of the 15—27 Case Tractor in Khandesh were continued this working season and the tackle has ploughed about 144 acres and 16 gunthas of cultivator's lands to the end of May last at Rs. 10 per acre realising about Rs. 1,444, although the charges are not yet actually recovered.

These machines require continuous and exhaustive trials in order to enable us to say something definite about their efficiency and use when compared with bullock power.

There is again the trouble of getting trained men to handle these machines as it is entirely new to this country and the men will have to be trained along with the continued trials until their advantage over bullock power is well established and widely spread and several people go in for them under normal conditions. The machines under trial met with numerous breakages during the trials on account of unsuitable conditions and raw men. There is not a very big demand for such machines at the moment and consequently the spare part service is very poor compelling us to stop the operations with a slight breakage until the broken part is replaced either by making it at one of the big engineering shops or importing it from the makers through the agents.

Continued exhaustive tests are the only solution to solve the above difficulties and enable us to form a definite opinion about the utility of these machines for cultivators in general and with this view in mind Government have recently been pleased to sanction another Tractor for trials in South Gujrath and when this is set in action along with the Fordson now at Chharodi in North Gujrath and the 15—27 Case again in Khandesh we shall be able to obtain valuable data about their performance.

The steam plough at Sawnur was not worked during the last fair season as Sardar Mahaboobalikhan withdrew his offer to take it on hire owing to failure of rains and scarcity of water.

Funds were again available for the completion of the Fodder Baling and Bruising Plant at Karajgi during the year under report and accordingly the two hydraulic presses, the Bruiser with elavator, Keith fan, platform, &c., the counter shaft the Fourthrow Hydraulic Pump, the engine, &c., were erected on their respective positions, the fencing for the whole yard completed with gates and an overbridge at the main entrance, the tram line laid all over the yard, for transport purposes, the frame work of the two sheds painted and the flooring of the big storage shed and the machinery shed finished in lime concrete.

The plant will be tried within a couple of months time and it is anticipated that regular work of pressing bruised Kirbi will be started from the middle of November next if the rains are favourable.

During the year under report there were only three pumping plants on hire to cultivators for irrigation purposes out of which two will be shortly returned and brought back to Poona owing to the parties' failure to pay the hire charges. Rs. 2,265-2-6 have been realised in the way of hire including Rs. 1,073-8-0 as old recoveries.

Along with the enquiries for the pumping plants on hire for irrigation purposes there are good many demands from agriculturists for emptying wells with power plants for sinking or deepening purposes. They are required generally for a very short duration and the expenses due to the foundation and erection are useless to the party after the work is completed. We have a very inadequate number of plants for this purpose and it is a matter for consideration whether such applications should be entertained for all and sundry.

The pumping plant at Nangaon on the river Bhima in Poona District irrigated about 79-31 acres of Perrenial crops 91-2 acres of Kharip and 164-14 of Rabi realising a total revenue of Rs. 4,272-10-0, during the year under report. This amount does not cover the actual expenditure incurred as the water is given to the cultivators on special concession rates. A scheme is under consideration of increasing the water charges so as to cover the total running charges and handing over the distribution of water to a co-operative society and we shall be able to know something definite about its feasibility during the next year.

Boring.—In addition to scrutiny and purchase of all stores and other equipments for the territorial officers and general advice in boring matters including purchase of new machines, removal of accidents, &c., to the divisions, individual inquiries and Local boards, the Department has converted one hand power Musto patent boring machine into a power unit for the South Central Division and inspected the boring machines in the Southern Division, South Central Division and North Central Division.

Three bore holes in a well at Wakora in Thana District were torpedowed with five charges with a view to open up the fishers underneath and tap more quantity of water. The result was not so very disappointing as the water level in the well was raised by 9".

The oil engine class trained 22 cultivator students in the running of oil engines and pumps.

In general there were varied sorts of activities in the Department throughout the year in which preparation of famine sets and the overhauling and getting ready of the old Fowler and Wyles Motor Plough for further trials were included.

The staff has been all along very satisfactory and most willing and enthusiastic.

W. M. SCHUTTE,
Agricultural Engineer, B. P.,
Poona.

Note.—A statement giving details of the famine pumping sites is attached herewith.

Statement showing Particulars of Famine Pumping sites (in Bombay Presidency) approved up to date.

Serial No.	Register No. of site.	Name of District.	Name of Taluka.	Name of Village.	Name of river.	Area available in acres.	Approximate total lift in feet.	Size of pump and power of engine required for full available area.	Survey No.	Remarks.
1	2	3	4	5	6	7	8	9	10	11
1	1	Broach ...	Broach ...	Yadeshwar Bet.	Narbada ...	200	30′	9″ Low Lift Centrifugal Pump and a 24 B. H. P. Engine.	...	Useful for famine only. Plant was already erected and worked in 1918-19.
2	2	,,	,,	Nikora ...	,,	150	60′	8″ ,, 40 ,, ...	...	Do. do.
3	12	Kaira ...	Matar ...	Pala (Juna Gamtal).	Sabarmati and Watrok.	100	32′	6″ ,, 15 ,, ...	113	Ideal site for 12 months crops.
4	15	,,	,,	Ashmali ...	Sabarmati...	100	32′-6″	6″ ,, 15 ,, ...	268	Do. do.
5	16	,,	,,	Radu ...	,,	150	37′	8″ ,, 18 ,, ...	665	Do. do.
6	24	Ahmedabad.	South Daskroi.	Miroli ...	,,	150	41′	8″ ,, 25 ,, ...	...	Ideal site.
7	46	Nasik ...	Niphad ...	Gondegaon ...	Godawari ...	200	35′	9″ ,, 30 ,, ...	58	Good site. Plant was already erected and worked by the Department in 1918-19.
8	69	Poona ...	Mawal ...	Nane ...	Indrayni ...	150	31′	8″ ,, 18 ,, ...	413	Useful in famine years only.
9	78	,,	Haveli ...	Chinchwad ...	Pavna ...	100	60′	6″ ,, 25 ,, ...	47	Plant was already erected and worked in 1918-19.
10	79	,,	,,	Dapudi ...	,,	95	55′	6″ ,, 22 ,, ...	25	Useful for 12 monthly crops.
11	84	Satara ...	Karad ...	Tambava ...	Krishna ...	190	56′	9″ ,, 50 ,, ...	595	Lift is great but the distribution of water is very easy.

Sarial No.	Register No. of site.	Name of District.	Name of Taluka.	Name of Village.	Name of river.	Area available in acres.	Approximate total lift in feet.	Size of pump and power of engine required for full available area.	Survey No.	Remarks.
1	2	3	4	5	6	7	8	9	10	11
12	85	Satara ...	Karad ...	Koparda ...	Krishna ...	187	56′	9″ Low Lift Centrifugal Pump and a 50 B. H. P. Engine.	124	Ideal site.
13	88	,,	,,	Malkhed ...	,,	144	56′	8″ ,, 40 ,, ...	...	Do.
14	90	,,	,,	Retre Budruk ...	,,	214	50′	9″ ,, 42 ,, ...	436	Good site. Plant was already erected and worked by the Department in 1918-19.
15	110	,,	Walwa ...	Kasegaon ...	,,	150	56′	8″ ,, 40 ,, ...	...	Ideal site.
16	111	,,	,,	Tambawa ...	,,	150	56′	8″ ,, 40 ,, ...	...	Promising.
17	131	Belgaum ...	Sampgaon ...	Dastikop ...	Malaprabha.	150	36′	8″ ,, 25 ,, ...	2	Useful in famine years only.
18	133	,,	,,	Kadrolli ...	,,	150	36′	8″ ,, 25 ,, ...	305	Do. do.
19	183	Dharwar ...	Ranibennur.	Chaudhanpur ...	Tungabhadra.	150	36′	8″ ,, 18 ,, ...	...	Ideal.
20	184	,,	Ron ...	Hollimani ...	Malaprabha.	300	30′	10″ ,, 32 ,, ...	...	Useful for famine only.
21	185	,,	,,	Gadgoli ...	,,	150	30′	8″ ,, 18 ,, ...	...	Do. do.
22	186	,,	Karajgi ...	Benchinhalli ...	Wardha ...	150	46′	8″ ,, 35 ,, ...	91	Promising site. Seven miles from Haveri Station.

C. G. PARANJPE,

Ag. Agricultural Engineer, Poona.

APPENDIX Q.

SUMMARY OF WORK DONE UNDER THE HORTICULTURIST TO GOVERNMENT OF BOMBAY, POONA, FOR THE YEAR 1923-24.

This is the third Annual Report of the Horticultural Section. During the last three years' our main efforts have been directed towards the improvement of fruits, by breeding and selection and development of fruit industry. Each of our publication, whether it may be a Departmental Bulletin or Original Article in the Agricultural Journal of India, and every public speech or demonstration gives a strong hope in the practical outlook of the development of industries.

Staff.

There is no material change in the staff.

Financial Conditions.

Grants at the disposal of the Horticulturist—

(1) Office of the Horticulturist including the grant for the District Horticultural Officer, Rs. 750.

(2) Ganeshkhind Botanical Gardens—

Year.	Sanctioned budget grant.	Expenditure.	Receipts.
	Rs. a. p.	Rs. a. p.	Rs. a. p.
1921-22 ...	17,415 0 0	12,414 13 4	7,542 3 8
1922-23 ...	9,475 0 0	9,128 7 2	5,413 13 6
1923-24 ...	8,057 0 0	7,988 6 9	6,819 0 9

(3) Modi Bag—

1921-22 ...	14,875 0 0	14,826 0 0	378 9 3
1922-23 ...	6,928 0 0	6,906 0 0	1,231 11 3
1923-24 ...	7,363 0 0	7,352 9 11	2,055 15 4

Teaching.

Teaching work in Horticulture for College students is conducted by the Horticulturist with the help of one Demonstrator. Besides this, we get a number of short course students and other outsiders who are being trained up in practical Horticulture by the Garden Superintendents.

As usual a class in elementary Arboriculture was held by the District Horticultural Officer for the benefit of men deputed by the Public Works Department.

Mr. H. P. Paranjpye's Book in Marathi on Fruit Crops which was in press last year is published and provides a useful reading.

Investigational Work.

Investigational activities are being carried out strictly in accordance to our programme submitted to the Director of Agriculture in 1921. Want of laboratory apparatus, scarcity of travelling allowances and inadequate facilities to carry out demonstration work have been keenly felt both in our investigational and advisory work. At any rate Horticultural Section has got to its credit this year the following publications:—

One Departmental Bulletin.

One Departmental Leaflet.

Five Research Papers in the Agricultural Journal of India.

Besides this, several important schemes regarding fruit improvement work in the Presidency have been brought forward. The details of our investigational work are summarised as follows.

Laboratory Investigations.

Major part of our laboratory work during the year under report deals with the sun drying of fruits such as Figs, Banana and Grapes. Besides, further detailed studies of Jhambul, Pine Apple, and Karwanda Juice also have been successfully made.

Sun-drying of Figs.—Sundried Poona Figs are not so superior as Smyrna figs but compete well with Grecian and Afghanistan imports. The cost of drying and packing including cost of packing material is Re. 0-4-4·8 per lb. It is definitely proved that about 20 to 30 minutes exposure to sulphur fumes gives a brighter produce than 10 minutes exposure. The results of our process are given in our original contribution to the Agricultural Journal of India, Volume 19, Part III and details showing the importance of this work as a cottage industry have been submitted to Director of Agriculture for his information. Introduction of Smyrna figs is strongly recommended.

Dried Banana.—Almost all types of Bananas growing in Maharashtra can be dried. Rajapuri Bananas give an attractive product when packed with sugar. Bleaching with SO_2 helps to preserve good colour. Dried Bananas when they are fumigated with Carbon Bisulphide and stored in air-tight containers keep without spoiling from insects or fungoid growths. People in Maharashtra can dry Banana just as people can do at Agashi.

Grapes.—The drying quality of all cultivated types of grapes has been tested. Phakadi, Kandhari and Pandhari Sahebi dry well and give agreeable raisins. Trial of better types such as Thomson seedless and Muskat of Alexandria has already been undertaken in some parts of Sind.

Dates.—Of all types such as Edalshahi, Tothar, Shinhuvari, Kechin keeps the best. This date can be ripened, fumigated with Carbon Bisulphide and packed for the market use. Our scheme for

the import of date suckers from Mesopotamia has been held back for the present. At any rate we hope to exchange large number of date suckers for our mango stocks with the Egyptian Ministry of Agriculture.

Pine Apple Juice.—A study of pine-apple juice has been thoroughly conducted; percentage of juice collected is 40. Our pine-apple contains 4·39% sugar. Impurities coagulate in pasteurisation and clerification is not very necessary. Although pine-apple market is very favourable for packing juice, the quality of the juice that we collect is unsatisfactory. Import of improved types is considered absolutely essential and it is recommended that a part of Amalsad Farm should be reserved for variety trials on a large scale. Method of bottling is the same as in the case of Jhambul Juice.

Karwanda.—Karwanda gives juice of greatly satisfactory value. Percentage of juice collected is 12 but its ultimate cost per gallon is almost insignificant. Impurities can be coagulated and juice filtered through ordinary felt or cloth filter. The method of bottling this juice is the same as in the case of pine-apple and jhambul juices.

Our greatest handicap in carrying out this work further is improper laboratory equipment. Our future great problems connected with the study of fruit juices are as follows:—

(1) Preservation of color.

(2) The value of condensed juices.

(3) Packing materials.

In case laboratory is not equipped, this work cannot proceed further.

Besides this our cold storage tests and determination of loss of fruit in transit are important investigations in hand. This work is progressing satisfactorily and will be published when completed.

Investigations in the Ganeshkhind Botanical Gardens, Kirkee.

Grape.—The progeny of high yielding vines marked as a result of selection has not borne any fruit as yet.

Work on the self-sterility of grapes will soon be published in the Agricultural Journal of India. It is definitely decided that Pandhari Sahebi will bear well if it is grown along with fertile types.

One seedling vine has borne fruit. Both as regards foliage and fruit it differs from Bhokari and Phakadi. This seedling marks an improvement on the Bhokari, our standard cultivated type. There are several hundreds of seedlings, more to be tested before results are expected to be of any economic value.

The distribution of raisin grapes has been undertaken on a large scale. About 3,000 cuttings have been distributed. We have got about 10,000 cuttings more in stock for Sind growers. Shikarpur Municipality has established a small orchard of raisin grapes.

Die-back of Citrus.—Die-back is a very serious trouble in our orchards. The results of our observations were submitted to the Director of Agriculture. Die-back Committee has been established to discuss our results and to plan further investigations. Our main line of investigation now is to test the resistance of various stocks used for orange and particularly study the reaction of roots of these stocks to root pruning. So root exposure and die-back investigations will be conducted side by side.

Packing of Mango Plants by Post for long Distance.—A detailed account of this work is already published in the Agricultural Journal of India. Considerable improvement has been made since then. Now mango plants packed by this method stand 48 days journey in good condition. English and African scientists seem to appreciate this method of packing plants.

Rice Improvement.—The work on rice improvement has been taken in hand by Mr. Joshi at Karjat. The results of square sowing system will be made available soon.

Potato Breeding and Selection.—Several new types have been developed. Results have been submitted to the Director of Agriculture for publication. Further work in this connection has been stopped except that some desirable types are multiplied at Modi Bag.

Banana Seedling.—Many seedlings have borne first fruits. Large number of new seedlings also have been raised. This work will be continued till better types than those which exist are developed.

Improvement of Guava by Selection.—Individual performance record of about 600 seedlings has been kept for the last three years. The seedlings show numerous variations. The coefficients of correlations for 129 trees have been worked out as shown in the following table :—

The relation of yield of 1922 to 1923 crop (number of fruits).	$+\cdot402 \pm \cdot049791$
The relation of yield of 1922 to 1924 crop (number of fruits).	$+\cdot171 \pm \cdot057653$
The relation of yield of 1923 to 1924 crop (number of fruits).	$+\cdot272 \pm \cdot054996$

The coefficients are all positive and show sure causation. The relation of coefficient to probable error is also satisfactory. Selected plants have been propagated further to test their progeny. The percentage of improvement in quality and quantity of our present stock will be shown later.

Besides this a great deal of attention has been given to transplanting and top working of Mango Trees. This brief account shows the roll of importance which Ganeshkhind Botanical Garden, Kirkee, is playing in the development of fruit culture in the

Presidency. This garden cannot be used by public in a better way than as a fruit farm. Great necessity has been felt to bring its forest area under cultivation. But irrigation facilities are not adequate. Retrenchment has badly hit this institute, particularly so far as the upkeep of the ornamental work is concerned. It is strongly hoped that both public and authorities will take liberal interest in the development of this garden.

Modi Bag.

Mango Stock Improvement.—Very remarkable results have been obtained regarding the relation of seed to the growth of the stock. Mango stones are classified as complete flat and incomplete according to their occupation from within by the cotyledons and useful relations are worked out from the growth of the stocks grown from such stones. It has seen found by analysing the record of 30 wild mango trees that complete stones may provide larger percentage of vigorous plants for grafting purposes in a comparatively shorter time than other types of stones.

Banana Selection.—The detailed biometrical studies in Banana relating to yield both in number of fruits per bunch and weight of individual fruit in each bunch have been undertaken. The correlations are all positive and their value is very low and do not indicate sure causation. The result does not seem to offer much evidence to show that quantitative factor is inherited.

Fig.—Notching operations were done on a large scale over an area of 30 gunthas and an increase of 5 lbs. of figs is shown per tree. In Bulletin No. 117 of 1924, comparison of the successful and unsuccessful areas here with those of the conditions in California where they are recognised as satisfactory, is made, very remarkable results which have been obtained by notching are described, and the theory of this operation is discussed.

Vegetable Improvement.—Extensive tests have shown that the greater Baltimore tomato has given excellent yield and market appearance. 21 oz. seed has been distributed and Leaflet No. 4 has been prepared. Improvement of tomato by selection is progressing well.

Foreign Introductions.—Introduction of Smyrna figs, Capri figs and various types of raisin grapes is the important work in hand at this farm.

The area of this farm is very insufficient for investigational work. It can only be used for variety collection. Irrigation, manuring and selection of stock and other experiments require larger acreage than what we have got at present.

Under the circumstances, our conclusions gathered from individual trees are not likely to benefit the fruit growers to the extent as we desire.

District and Advisory Work.

District work during the year under report has grown by leaps and bounds. 389 enquiries as compared with 300 in the previous year have been dealt with. Enquiries from outside the Presidency are increasing. Most of the enquiries deal with the industrial aspect of fruit market and manufacture rather than cultivation.

District Nurseries.—The nursery at Kolhar near Rahuri was closed down on 31st December 1923. In this nursery about twelve people had been trained in the art of budding besides students of the higher classes in the local vernacular school. One gratifying feature of this is that two teachers in the local Urdu school took advantage of the nursery and learnt the art of budding orange plants and the method of improving wild jujube trees by budding process. Some of the men learnt the art of grafting mango trees also. The fieldman in charge of the nursery was very useful in demonstrating the method of catching orange moths at night time.

The second Mango Nursery is now recently started at Dharwar. There is, however, one thing which is noticeable in all proposals to start a nursery, that when associations ask for our help in this matter they, as a rule, do not guarantee a certain number of students to learn the art and who would take up nursery business afterwards as a means of livelihood. The nursery, therefore, degenerates into a miniature Government concern.

Public Speeches.—The members of this section have addressed six largely attended public gatherings and explained the importance and possibilities of fruit cultivation and fruit industries in the Presidency. The Government of Bombay have appointed a committee at the request of the fruit growers to investigate into the question of marketing and preparing of mango products.

Demonstrations —The following table shows the number of demonstrations given to the growers during the year under report:—

Place of Demonstration.	Date.	Subject.	Remarks.
Ratnagiri ...	29-1-1924 ...	Spraying of Mango diseases.	Before the members of the Development Association a short speech was made.
Ratnagiri ...	24-4-1924 ...	Bottling of fruit Juices	A public speech was also given.
Vengurla Mango Orchards.	30-4-1924 ...	Spraying of Mango diseases.	...
Modi Bag, Agricultural College, Poona.	24th and 29th 3-1924.	Drying of figs ...	Demonstration was given to the students of the Poona Male Training College.
Saswad ...	25-5-1924 ...	Drying of figs ...	About 400 fig-growers attended the meet, where a public speech was given.

Two lectures were delivered at the show at Bhadli in East Khandesh.

In last October a class was held at Nipani where local cultivators were called together for a week daily and they were given practical lessons and demonstrations in various methods of plant propagation; in removing and extracting borers from mango trees, repairing the cavities of mango stems, and selection of sites for fruit trees such as citrus and grapes.

This is in brief a year's work of this newly established Horticultural Section of the Agricultural Department. We strongly hope that the practical value of this work will be fully recognised by the public.

G. S. CHEEMA,
Horticulturist to Government,
Bombay. Poona.

APPENDIX R.

Summary of Work of Agricultural Propaganda in North and Middle Sind, July to December 1923, under the Assistant Registrar of Co-operative Societies, Sind.

I have the honour to submit my report on the progress of Agricultural Propaganda work for the period ending 31st December 1923.

In accordance with G. O. No. 5805, dated 10th January 1923, I was appointed Agricultural Propaganda Officer in addition to my duties as Assistant Registrar, and the following 8 talukas were assigned to me for carrying on intensive Agricultural Propaganda work:—

North Sind ... Ghotki. Sukkur. Larkana. Kambar.

Middle Sind ... Shahdadpur. Halla. Hyderabad. Tando Allahyar.

I took charge of my new work on 20th January 1923, and with the below noted staff set to work out the undermentioned programme which had been chalked out for me :—

North Sind.

(1) Agricultural Inspector, Mr. Lokram.

(2) Three District Agricultural Overseers.

Middle Sind.

(1) Agricultural Inspector, Hajee Abdul Rahman.

(2) Three District Agricultural Overseers.

Programme of Work.

(1) To popularize and distribute approved varieties of seed.

(2) To popularize and distribute approved Agricultural implements.

(3) To propagate modern methods of farming.

(4) Generally to formulate schemes that may tend to a successful execution of the above programme, *e. g.*, formation of Taluka Development Associations; opening of implement sub-depots, local manufacture of modern implements, &c.

Before dealing with the actual working of the above programme I would like to give a brief survey of the condition of the seasons during which I had to work.

Seasons and Inundation.

The Rabi season of 1922-23 was not quite satisfactory, partly because the lands were poorly inundated and partly because there was hardly any rain in the cold weather of 1922-23 with the result that the Bosi crops, in particular, suffered considerably.

With regard to the Kharif of 1923-24 the river was very hopeful in May, but went very low in the first fortnight of June, and began to improve only by the first of August. This delayed the sowing of rice, jowari and cotton considerably. From 1st August to 1st September the stream was wonderfully steady which saved the situation, though Kharif crops required one more watering; still both Kharif and Rabi crops were on the whole fairly good.

I. Popularization and Distribution of approved Varieties of Seed.

A. Pusa 12—Wheat.—In September 1922, I was offered the Agricultural Propaganda work at Poona and on my return immediately proceeded to Upper Sind and took to distribution of Pusa 12 Wheat which was known in the Agricultural Department to be of very superior quality. About 800 maunds were for the first time distributed in Sukkur, Ghotki and Pano Akil Talukas and about 200 maunds in Middle Sind. The Zamindars were at first hesitating to introduce the seed in their lands, as they were quite ignorant of it before. During the course of its germination and final harvesting, however, the following properties have come to light:—

(1) The crop is wonderfully free from rust, while every other local variety suffered from it.

(2) It yields at least 2 maunds more per acre.

(3) Its glutin percentage is higher which makes it more tasteful and nutritious and enables it to command about 8 annas higher price per maund in the market.

(4) It ripens about one or two weeks earlier and thus escapes the occasional adverse South Westerly winds which tend to shrivel the grain.

The Pusa 12 variety thus met with universal appreciation and Khan Sahib Chakarkhan, a leading Zamindar of Kandhkot, Sardar Khan Ghoto of Ghotki, K. S. Dilmurad Khan of Jacobabad and others have kindly furnished certificates which eloquently speak of the superiority of Pusa 12.

Mr. Howard, the pioneer of this variety who came to inspect the crop on 30th of March 1923 along with Mr. Main had also

expressed warm satisfaction at the condition of the crop and was finally of opinion that the crop suited the tract admirably.

The Pusa 12 having thus established itself as universally popular the Khatedars and Haris who had grown it did not like to resell it to the Department. They wanted to store it for their personal use either for consumption as food or multiplication as seed. Moreover, the seed having been distributed in scattered patches it was difficult for the departmental agents to collect it. Besides the prevailing practice of financing Pusa 12 Wheat, *viz.*, buying departmentally at harvest time and selling at sowing time appeared fraught with many disadvantages. In the first instance it involved too much account keeping besides if at any time the prices fell the Government had to sustain loss. To safegaurd against these drawbacks I negotiated with one Seth Tilockchand of Sukkur who agreed to purchase and stock Pusa 12 Wheat seed and sell it during the ensuing Rabi under orders of the Department. At Ghotki and Jacobabad also I made similar arrangements with local Zamindars. The Divisional Board approved of this arrangement and had also passed a resolution guaranteeing Seth Tilockchand against any loss owing to fall in prices, &c., subject to a maximum limit of annas five per maund within a total amount of Rs. 3,000. The total quantity secured and distributed during this year through this agency was about 2,000 maunds. The price of wheat at the time of sowing was very low indeed and the Department might have sustained some loss but as the appreciation of the seed was very great the buyers who were mostly the members of Co-operative Societies did not at all mind paying a little higher price than the prevalent market rate, with the result that neither the Government nor Seth Tilockchand or any one else sustained any loss. Added to the 2,000 maunds of wheat seed referred to over and above the quantity reserved by the Zamindars for the purpose of multiplication, the total quanitity of Pusa 12 sown during this Rabi would be about 6,000 maunds.

There was indeed much greater need than the above quantity and I had thought of supplementing the available stock by importing more Pusa 12 from the United Provinces. But the quotations of that side were nearly double those of Sind and hence I had to rest content this year with what could be secured locally.

B. 27 W. N. Cotton.—Only 100 maunds of this seed were spared by the Department for distribution in the propaganda area. Most of this seed went to Co-operative Societies in the Hatri Union. The area in which this seed was sown was irrigated by the Kashki Canal which did not flow properly. It was not, therefore, possible to sow the seed earlier than the end of June and beginning of July, *i.e.*, about a month later than usual. Besides the seed supplied this year by the Agricultural Department was not grown at any farm but had been obtained from the cultivators' produce. It was unfortunately not of pure quality with the result that the germination was poor on the whole, and the cultivators had to resow blank patches in several places. This fact was duly brought to the notice of Mr. Main. The

Bokhro disease besides which was common in cotton crops also attacked the 27 W. N. The general impression regarding this variety has not, therefore, been quite favourable. I beg to submit herewith Mr. Abdul Rahman's detailed report regarding the 27 W. N. cotton seed for perusal of the Board.

C. Bhitshah Cotton Seed.—Bhitshah cotton is a variety of reputed cotton in Sind. The ginneries pay a premium of Re. 1 to Rs. 2 per maund for this variety. It has a ginning percentage of about 40 and yielding qualities higher than the ordinary Sindhi cotton. The 27 W. N. quality not being adequately available for supply I made arrangements with one Seth Radhakrishin, a big Sethia of Shahdadpur Taluka, to finance and supply this seed. The Department undertook to inspect that the seed cotton used for ginning was from the selected picks of Bhitshah crops and that the ginning was regulated at proper speed to avoid breakage of seed. After ginning the seed it was further sifted of dust and other impurities. Indents for this seed were executed by the Agricultural staff. About 2,000 maunds of this variety were in all distributed in the four cotton growing talukas, *viz.*, Halla, Hyderabad, Tando Allahyar and Shahdadpur. The germination from this seed has been excellent and Zamindars, who had sown it, have expressed both written and oral satisfaction. Apart from having better germination the Zamindars report to have effected much saving in the seed rate. Usually they put 40 to 70 lbs. per acre, but 20 to 25 lbs. of machine-ginned Bhitshah have been found to give sufficiently thick stand of the crop and only 12 lbs. of hand-ginned Bhitshah were put in per acre with equally good germination. In several instances seed was delivered at the Zamindars' villages or at Railway Stations nearest to them. Seed depots were also opened at Taluka Head Quarters for retail sale. When germination reports of the first consignment got abroad there was great rush for the seed and the stock was exhausted immediately. The Bhitshah seed has been so popular that it has washed away from the Zamindars' minds, the unfavourable impression created by N. R. Moreover the success of this seed has gone a great way to induce the people to repose confidence in the Department and I might safely assert that the large sale of our implements is mainly due to the success of this seed.

D. American Cotton.—An experiment was also made with American Cotton in Tando Allahyar Taluka. An acre was sown with this seed and the result was highly satisfactory.

E. Berseem and other miscellaneous Seeds.—Out of the newly imported Berseem seed from Egypt the Deputy Director allotted 1,360 lbs. for the Middle Sind Division which was distributed promptly. As fodder crop is valuable round about Hyderabad, the growers were very grateful to receive this seed. The germination has been excellent but the growth up to date has been less vigorous probably due to abnormality of weather conditions. Inquiries and indents regarding Lucerene and vegetable seeds were also suitably attended to and complied with.

II. Demonstrations of improved Implements.

Village to village demonstrations with the below noted implements and machines were held. In all about 400 villages, hamlets and fields were thus touched during the period and some of the places were visited more often than once. Moreover, big central demonstrations at the Head Quarters of each of the 8 talukas were organized from time to time where our implements were worked side by side with the local ones. The attendance at these demonstrations was always very satisfactory. Oral lectures on Agricultural Industry and on possible methods of better crop formed also a prominent feature of these demonstrations. The success of these demonstrations may be gauged from the indents received and complied with.

Ploughs :—Rajah, Monsoon, Egyptian and Meston.
Water lifts—Screw lifts.
Scrapers.
Clod crushers.
Drill tubes.

While the Rajah plough (costing Rs. 60 each) is considered to be the plough for the rich, the Egyptian plough has commanded much appreciation and popularity. No less than 700 ploughs in all were sold in the 8 talukas of which 97 per cent. were of the Egyptian type. It costs only Rs. 6 to Rs. 8 and is locally made and works with an ordinary pair of bullocks.

With a view to meet the great demand for the Egyptian plough and other implements, arrangements were made at Hyderabad, Larkana, and Sukkur for the local manufacture of implements. The carpenters of the firms were trained in the manufacture of implements and the firms were given all convenience and instructions from time to time as to the measurements of several parts and the kind of wood to be used. These works are from time to time supervised to see that the outturn is satisfactory as regards workmanship, materia daily output, &c.

Hand Archimedian Screws.—Owing to poor inundation last year the flow areas stopped receiving water just at the sowing time when our hand Archimedian screw came to the aid of the cultivators. This is a very handy water lift easy of fixture and transport giving about double the quantity of the local Hurla. It is worked by hand and has been found so serviceable specially by the Larkana Taluka people against falling water that the Agricultural Association of that taluka during its last meeting resolved to have half a dozen prepared at once at the outset. About 15 such lifts were also sold in Middle Sind.

Two-cultured Wheat Drill.—By this two rows could be drilled at a time instead of one as usual. With a view to economizing labour and time, this implement is being used and has found favour in

Larkana Taluka. About 10 acres have been experimentally drilled with this tube, to demonstrate its efficiency.

Implement Sub-depots.—With a view to further popularize the departmental implements and bring them within easy reach of even the humblest of agriculturists, sub-depots have been experimentally opened for the present at two places, *viz.*, Bagarji and Larkana.

The object of the sub-depots is threefold :—

(1) To keep a stock of implements ready for sale so that the indentor may not have to wait till the implements desired are manufactured in Mirpurkhas or Bombay.

(2) To give the implements on a nominal rent of 1 or 2 annas a day to such poor people who cannot afford to buy them.

(3) This rent system gives the fullest opportunity to the user to examine the implements more scrutinizingly before he makes up his mind to buy them.

As sub-depots have been opened recently there has not been any phenomenal progress to report but there is not the least doubt that they will grow popular when the proper season of cultivation comes in.

The following table would give an idea of the implements disposed of through the agency of this Department :—

Description of Implement.	
Egyptian plough	... 650
Iron plough	... 14
Rajah ,,	... 4
Scrapers	... 5
Drill tubes	... 9
Yokes	... 12
Heavy clod crushers	... 4
Archimedian water lifts	... 30
Monsoon plough	... 43
Iron chains	... 12
Iron chunis	... 50
Ridging boards	... 5

The above list shows that every attempt has been made to make the people acquainted with the various implements of the Department and their appreciation could be judged from the sales effected.

III. Demonstrations in approved Methods of Farming.

A. *Drilling Demonstration in Cotton.*—In all more than a dozen plots had been secured on private fields to show drill methods, but owing to poor inundation only 10 plots of area varying between 1 to 2½ acres were actually organized and drilled in Talukas Hyderabad, Shahdadpur and Tando Allahyar. The seed drilled in all cases was 27 W. N. except in one instance in which about 1½ acres had been sown with hand-ginned Bhitshah for comparison sake. A lot of difficulty had to be contended with in going through the programme of the demonstration plots referred to above, scarcity of water being the most unsurmountable one. With every fall of the river the water courses ceased to run and consequently water from the plots was cut off. Besides two resowings had to be done in almost all the plots as the germination of the 27 W. N. was not so satisfactory, the seed supplied being itself of an inferior quality.

Apart from drilling the above plots directly by the Department, trained staff assistance was also rendered to some other big Zamindars who put about 5 acres of land each under drill method by their own labour which had been trained by this Department. These plots also were regularly inspected.

The stand, yield and immunity from disease in all these drilled plots have convinced not only the growers of these plots, but also other cultivators with the result that many people are now desirous of following this practice of cotton cultivation.

Visitor's days were arranged when batches of Zamindars were taken to the nearest plots and advantages of the drill system explained to them. The growers have acknowledged the following advantages of the system :—

1. There is saving of hoeing expenses to the extent of Rs. 10 per acre.

2. The drilled cotton can withstand drought much better.

3. The rate of growth is quicker in drilled plots and the plants more vigorous.

4. The yield has been comparatively a little greater than the adjoining broad cast plots and had it not been due to heavy frosts this year, this point particularly would have been very conspicuous.

B. *Hot Weather Ploughing.*—This sort of ploughing is very necessary for the Rabi crops. Most of the wheat crops suffer lamentably on account of absence of proper moisture in the earth. To remedy this, hot weather ploughing has been deemed to be most efficacious. It implies ploughing up of land immediately after the harvest in the months of May and June so that the land may be thoroughly aerated and thus be able to absorb thoroughly and retain effectively every drop of monsoon water that enters its womb during August and September. Half a dozen plots have been

ploughed in the last hot weather in North Sind and the results will be watched in due course in the Rabi crop.

C. *Cold Weather Ploughing*.—This sort of ploughing is also as essential for the Kharif crops as hot weather ploughing is for the Rabi crops. Steps have been taken to-plough about 6 plots in this cold weather.

D. *Practical Demonstrations in Rice Plots*.—Larkana and Kambar being primarily rice growing talukas the main lines of work here were :—

(1) Economy in seed rate.
(2) Early transplantation.
(3) Bengal variety *vs.* ordinary variety.

With a view to have an exact idea with regard to the above three phases of rice cultivation about half a dozen plots (of area varying between 1 to 2½ acres) were secured in the two talukas and experiments carried on in them. The following conclusions have been arrived at :—

(1) *Economy in Seed Rate*.—The usual seed rate of rice is one maund per acre but the Department demonstrated with half the quantity. I personally inspected these crops and as a result of inquiry from the Zamindars concerned am glad to submit that the experiments proved successful and the Zamindars realized so.

(2) *Earlier Transplantation*.—The nature of inundation being most fitful in Sind, the earlier sowing of rice has been found to be imperative so that the crop may be able to ripen fully in time. The usual practice is to sow the seed in the nursery beds only after the water begins to run in the canals. If seedlings were grown on the existing wells and on the banks of the main canals for outlying lands at least 25 per cent. of the total area could be sown about 25 days earlier than usual. This 25 days earlier transplanting has been actually found to have remarkable effect, upon the yield to the extent of almost doubling it up.

The other advantages of this system are that—

(*1*) There is very systemetic division of labour.

(*2*) It insures the crops against failure in the event of early fall of water.

(*3*) It tends to mature the crops earlier thereby making the realization of better prices highly probable.

(*4*) It liberates the soil much earlier so that "Dubari" crop is sown in time.

(3) *Bengal Variety of Dadkhani Rice*.—This variety has been introduced with an amount of success in the tract. Its peculiarities are :—

(*1*) That it requires only 10 seers of seed per acre, *i.e.*, ¼ of the ordinary seed rate.

(*2*) It is a very heavy yielder.

(*3*) It is very delicious in taste.

The only precaution to be taken with regard to it is that it must have a pretty assured water supply and a fortnight more to ripen.

The Zamindars have grown to appreciate this variety very much and they expressed their satisfaction both to Mr. Main and myself on my tour.

The area under rice cultivation in the two Talukas of Larkana and Kambar alone is about 1¼ lacs of acres. If the results of the above three experiments, simple and inexpensive as they are, be applied and adopted the net gain to the Agriculturists will be enormous annually.

E. *Combat with Crop Pests.*—Complaints of rats doing damage to onion and wheat fields were effectively attended to and the Zamindars concerned were given rat poison. They appreciated it much and have sent in their written testimonials expressing their satisfaction. As this was the first year the poison was supplied free.

Inquiries were also received in connection with cotton pests and general precautionary measures were suggested. It is in my opinion very necessary that some agricultural expert (preferably the cotton breeder) should be specially deputed to investigate these diseases and suggest remedial measures.

IV. Inauguration of Taluka Development Associations.

With a view to facilitate the work of intensive Agricultural Propaganda, Taluka Development Associations have been deemed to be the best medium. I, therefore, organized eight such associations one for each of the eight talukas assigned to me. They have all commenced their work with an initial capital noted below against each:—

(1) Halla	... Rs.	800
(2) Hyderabad	... ,,	900
(3) Shahdadpur	... ,,	800
(4) Tando Allahyar	... ,,	1,000
(5) Larkana	... ,,	1,165
(6) Kambar	... ,,	700
(7) Sukkur	... ,,	400
(8) Ghotki	... ,,	600

I have regularly been attending their periodical meetings and steps are being taken to execute every branch of Propaganda work under their auspicies, *e.g.*, demonstration work, seed and implement distribution, &c. The associations in their turn are busy securing

indents for seed and implements. Most of the associations have purchased implements for demonstration, sale and hire while the association of Hyderabad has gone a step further, *i.e.*, it has appointed its own Kamgar for field demonstration. Their budget estimates for the ensuing year have been prepared and are pending approval of the Board.

General.

Tour.—With a view to make the Propaganda work as best effective as possible I had to tour round in the Propaganda area very frequently at least once every month in each taluka. During the course of the tour I attended several demonstrations and delivered lectures on the advantages of improved implements and good seeds. The doubts and difficulties of the Zamindars on these heads were likewise solved both by myself and the Agricultural Inspectors. Among those who took the best interest in the work I must confess that the members of Co-operative Societies stand foremost, because they had both organization and money. In my opinion the fundamental difficulty why the agriculturists could not so far avail themselves of the suggestions of the Agricultural Department was "money" and I am glad to say that Co-operative Societies have offered much help in the solution of this difficulty.

Conclusion.

The result of work done during the brief period of 12 months at my disposal, as judged from the foregoing paragraphs, is indeed promising. In the eight talukas placed under me, people have learnt to appreciate the value of implements, seeds and methods of farming suggested by the Department and I hope if vigorous Propaganda is carried on by the Department for two more years, through the agency of the Taluka Development Associations, they will develope themselves fully during this time and will in future be able to conduct their business unaided by any official agency and thus liberate the Agricultural Department to tackle other talukas of the Province.

My best thanks are due to the two Inspectors, Messrs. Lokram and Haji Abdul Rahman, for the very sincere help they rendered me in materializing the above programme of work.

AZIM KHAN,

Assistant Registrar,
Co-operative Societies, Sind.

Mr. Abdul Rahaman, Inspector of Agriculture, Middle Sind's Report regarding the 27 W. N. Cotton Seed.

Introduction of 27 W. N. Cotton in Middle Sind.

In 1922, for the first time 60 maunds of this cotton seed were distributed in this division and in the year under report 100 maunds of the seed were kindly spared for this tract. Most of it went to below noted societies in Hatri Union and all these places are adjoining and within a mile or less from each other. The Canal on which this area depends began this year flowing by the beginning of June and then there was stoppage of water for a fortnight or so due to fall in the river. The people were, therefore, in a position to sow this cotton by the end of June and beginning of July about a month later than usual:—

(1) Hatri.
(2) Tando Sayed Khan.
(3) Kasim Gaho.
(4) Phatoo Bhagal.
(5) Ismail Chand.

The previous year's supply of this seed was from farm grown stuff and the area being under departmental control was comparatively better than this year's supply half of which it is said was obtained from cultivator's produce. The germination was so very poor that people had to resow blanks. The general complaint of the growers took the shape of a written report from their Officer who happened to visit those societies at the moment. I reproduce a portion of that:—

> "That while auditing Gaho and Bhagal Societies I have heard complaints about the bad quality of cotton seed supplied by our Department. These members inform me that the seed is utterly useless and all their labours have gone for nothing. I have secured a sample of the seed for your inspection. I submit that this mixture of good and bad seed has created bad impression among the societies people and this is likely to affect adversely on the confidence which people repose in us."

On inspection of the sown area the following state of affairs was witnessed on site:—

Society.	Bhagal.	Gaho.	Chand.	Tando Sayed Khan.	Hatri.	Total.
	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.
Quantity of seed given ...	15	15	12	15	4½	61½
Number of members supplied with seed.	21	16	23	17	5	82
Their total area ...	33	33	23	32	10	131
No. of men whose germination was good.	6	7	11	6	3	33
Area of above ...	14	10	7	15	7	53
No. of men whose germination was bad.	7	8	12	11	2	40
Area of above ...	19	23	16	17	3	78
No. of men advised to reject the seed.	8	1	1	...	...	10

From the above it will be seen that about 60 per cent. of the area was bad and 42 per cent. area was good. The bad areas were resown with ordinary seed and no more seed of N. R. was available.

The general opinion of the seed was the same as above pointed out by the Auditor.

Besides the above area in compact group of villages the following were supplied with this seed at their request. The condition of their crop is noted in the same statement :—

	Name.	Quantity supplied.	Area sown.	Condition of germination.
		Mds. seers.	Acres g.	
1	Seth Radhakirshin ...	10 20	8 20	Good germination.
2	Seth Haji Mohamed ...	4 20	3 20	Do.
3	Akhund Atta Mohamed ...	4 20	Nil.	Fed to cattle.
4	Mr. Manohardas ...	10 20	30 0	Not inspected.
5	Mukhi Harkishindas ...	1 20	2 20	Poor, resown with N. R.
6	Mr. M. A. Jagtiani ...	4 0	5 0	Do.
7	Bachal Brothers ...	3 0	Nil.	Fed to cattle.
	Total ...	38 20	49 20	

On the whole it may be said that even with the above growers the seed did not do well. As regards germination with the qualified graduate cultivators like Messrs. Jagtiani and Manohardas the seed behaved in the same way. We had to resow twice in Jagtiani's fields. Bokhro disease was in evidence to a little more than normal. Poor germination compelled some of the Zamindars to resow with local seed but wherever spare quantity of N. R. seed was available it was made available with the efforts of the Department for some of the resowings.

The lands put to this cotton were generally good and well cared after. On inspection of the seed a sample of which was submitted to higher authorities personally, such Zamindars who were accustomed to using good seed, rejected it. Thus we lost about 90 acres of cultivation or about 33 per cent. of the 100 maunds supplied. Next inspection was done towards end of August and beginning of September. The plants were 3 feet to 5 feet in height, healthy first weedings have been done and in the best plots 2nd weeding has just commenced. The plants everywhere with the exceptions of late sown area have just commenced flowering, and in exceptionally good cases tiny fruit is in appearance. The cotton wilt was in appearance

both in Sindhi and N. R. Cottons to the same extent of about 1 plant diseased in every 200 plants.

There was a regular mixture of American Cotton in both good and bad crops averaging from 4 to 8 per cent. which is easily noticed and cultivators willingly weeded out the American plants when asked to do so. In places where the crop is not thick the cultivators refused to weed this out.

The tinge of the foliage of N. R. was everywhere lighter than Sindhi Cotton. This is probably a varietal pecularity than any defect in N. R.

The late sown fields which represent about 60 per cent. of the area put to this cotton are stunted not more than 3 feet high and the rate of American mixture same as in all fields. Only one weeding has just been finished and have received only two waterings as yet.

As regards purity the N. R. crop sown from good seed bags and in areas in which resowings were done not from local seed but from the reserve stock of N. R., there were found to be almost the same quantity of mixture as will be evident from the record of following countings. An area of 10 paces by 20 paces was observed from each cultivator's field.

The plants counted—

Name.	Total No. of plants.	American.	Broad lobed.	Yellow flower.	Remarks.
Kadir Bux ...	318	16	21	17	In these countings, areas which were re-sown with local seed are not included.
Fazal ...	184	7	28	9	
Gulan Shah ...	272	15	18	8	
Isan ...	202	6	11	4	
Mohamed Saleh ...	326	11	23	6	
Muridalishah ...	308	8	30	12	
Usman ...	266	6	17	4	
Pir Bux ...	343	12	19	15	
Ahmed Nuhani ...	129	7	29	2	
Average and Total ...	2,348	88 3·8%	196 8·3%	77 3·2%	

It will be seen from these test calculations that besides American Cotton mixture yellow flower plants were present from about

2 to 6 per cent. and also broad lobed leaves to the extent anything up to 10 per cent.

There is strong opposition of men to weed out mixture. In the local Sindhi Cotton flowering is not yet commenced.

The third inspection of N. R. was done in beginning of November. The water has stopped early in September from these cottons. The N. R. is suffering from "Moorh" and "Ratti" diseases just as Sindhi Cotton. The yield is expected to be much affected adversely. The plants have attained generally good size and cotton has received in all from 2 to 4 waterings. Forming of bolls is general though not profuse. There is evidence of less mixture of American than seen at the last inspection. As regards mixture of yellow flower or broad lobed plants following countings were made. Two beds were observed from each field.

Grower.	Yellow flower.	Broad lobed, white.	Total No. of plants in bed.	Mixture percentage.
Mahomed Bux ...	14	11	87	29%
Kaim Shah ...	21	9	99	30%
Ibrahim Jalal ...	18	12	105	29%
Sheru ...	14	10	74	32%
Urs ...	16	8	93	26%
Muridalishah ...	23	18	82	50%
Umer ...	19	12	116	26%

At the time of this inspection many plants which had not flowered at the time of 2nd inspection could be distinguishable. The mixture of yellow flower was from about 15 per cent. to upwards to 25 per cent. the mixture of broad lobed white flowered plants was from about 9 to 20 per cent. The American was either absent or hardly $\frac{1}{2}$ per cent., as men have weeded it out because they say its interference excludes light and air from the Sindhi plants. Few bolls have opened hardly half. per cent.

People were advised to keep their produce separate as arrangements were in progress to get them a premium for N. R. Cotton. They were, however, not willing to keep it separate because they said that the N. R. phutties were lighter than Sindhi and had not done as well as Sindhi. If they would mix it to their bad N. R., samples would pass with Sindhi as good besides the advance sales of phutties were in full swing and the people wanted money, the cultivators sold away the crop before picking.

Some growers who were in the habit of selecting their own phutties for seed were induced to pick from proper N. R. plants good phutties and stock it for next year's seed.

Arrangements were entered into with the ginning factory of Honourable Mr. Bhurgri at Hyderabad to purchase these who authorized their local agent residing near these societies to purchase the N. R. phutties and label them separately so that these could be ginned separately.

The last inspection was done early in December when all cotton was killed by frost and people who had sown late had lost heavily.

Chand, Hatri, Gaho and Bhagul Societies who had resolved to select from N. R. fields, proper well opened bolls and keep their phutties for next year's seed could not do so because frost killed the cotton before they commenced 2nd picking and phutties from 2nd picking is considered the best.

Supplementary Notes on Agricultural Propaganda Work in Sind.

In section IV of my Annual Report on Agricultural Propaganda Work I have dealt with the inauguration of Taluka Development Associations in all the eight talukas of the Propaganda area, and the main lines on which these Associations are to carry on their work. During the period of four months that has since elapsed, special attention was devoted to the development of these institutions and I am glad to say that they are now progressing favourably. In addition to their subscribed capital already referred to in the report, each Association has received Government subsidy.

I. Working of Taluka Development Associations in Upper Sind.

A. *Demonstration of approved Implements.*—Three out of the four Associations in Upper Sind, *viz.*, Larkana, Sukkur and Ghotki have maintained their Kamgars, pairs of bullocks and carts. In the fourth taluka, *viz.*, Kambar also the Association has appointed a Kamgar and proposes buying a pair of bullocks in September next when sowing operations commence. Implements are carried from village to village and demonstrations held. If any Zamindars desire, some of their plots are actually ploughed by the Associations' Kamgar on a light rental. This arrangement gives the Hari an opportunity of acquiring the first hand knowledge of working the modern implements and forming an unbiased estimate of their superiority. He may even be induced by these measures to purchase the implement.

While demonstrating the working of the superior ploughs the advantages of hot cold weather ploughing are also propagated as a necessary corollary.

B. *Manufacture of Implements, their Sale, Hire, &c.*—All the four Associations have opened their depots where implements have been purchased and stocked for the purposes of demonstration. Arrangements have also been made at Sukkur with a local Maistri for the execution of indents for implements required in all the four talukas of Upper Sind in the Propaganda area.

C. *Distribution and Multiplication of Pusa 12 Wheat Seed.*—Kambar is altogether a rice growing tract and hence no arrangement for the distribution of wheat seed has been made there. As for Ghotki and Sukkur, the Associations have started two seed societies whose function will be to purchase wheat grown out of the seed hitherto supplied and stock it for distribution during the next Rabi. As for Larkana, one of the most leading Zamindars and members of the Association has volunteered to purchase, stock and resell Pusa 12 in a similar manner for multiplication purposes at his own risk.

II. Taluka Development Association in Middle Sind.

A and B. *Demonstration of Implements and their Manufacture.*—The Association in Middle Sind, namely, Shahdadpur, Halla, Hyderabad and Tando Allahyar have also like their sisters in Upper Sind entertained their own Kamgars who carry on implement demonstrations from village to village. They have likewise opened their own Depots of demonstration implements and have also made arrangements for the local manufacture of the ploughs, &c.

C. *Distribution of Seed.*—The work of distribution of cotton seed has been taken over by the four Taluka Development Associations of Middle Sind. All the four talukas are cotton growing and the Associations have so far distributed no less than 1,600 maunds of pure British cotton seed which is reputed to be of best quality. All the seed was purchased from factory owners of Tando Adam.

General.

In all the eight talukas of the Propaganda area the Associations are securing plots from Zamindars for experimental purposes and the Departmental Officers are carrying on their demonstrations in improved methods of farming in them, *e. g.*, drill method, &c.

During the first year the agricultural Propaganda work was carried on solely by the Departmental Officials but now that the Taluka Development Associations have been started it is proposed to entrust a major portion of the work to them, more especially the distribution of seed and demonstration of implements.

The advantages from this procedure are obvious and may be briefly summarised as under :—

(1) The Department will be saved from the botheration of dealing in seed, which has in several instances resulted in financial loss to Government.

(2) Much of the time of the Departmental Officials which at present is being devoted to keeping accounts, carrying on correspondence, effecting recovery, clearing arrears, &c., would be saved.

(3) Moreover, the arrangement has a tendency to reduce Government Expenditure, could be gauged from the comparative budget figures of last year and this. Last year a sum of Rs. 4,000 had been sanctioned for Propaganda work in these areas, while this year owing to the existence of Taluka Development Associations the amount has been reduced to Rs. 3,000.

(4) As soon as this system of carrying on Agricultural Propaganda work is established the work of the Department will be minimised and in a short time the Department will be free to carry on intensive work in other tracts by turns.

AZIM KHAN,
Assistant Registrar, C. S., Sind.

List of Agricultural Bulletins published by the Department of Agriculture and kept for Sale at the Government Book Depot, Bombay, Poona.

No.	Year.	Subject.	Price. Rs.	a.	p.
32	1908	Locusts in India, by H. M. Lefroy, Imperial Entomologist, Pusa ...	0	8	0
33	1909	Cultivation of Broach Cotton in Dharwar, by M. L. Kulkarni, Divisional Inspector of Agriculture, S. D. ...	0	4	0
,,	,,	,, ,, (Kanarese) ..	0	4	0
34	1909	Night-soil—A Valuable Manure, by G. K. Kelkar, Assistant Professor of Agriculture, Agricultural College, Poona ..	0	4	0
35	1909	Kalar in Sind, by G. S. Henderson, Deputy Director of Agriculture, Sind.	0	4	0
36	1910	First Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency, by W. Burns, Economic Botanist ...	0	14	0
37	1910	An Examination of the Seed-Supply of the Broach District, by G. D. Mehta ...	0	4	0
39	1910	The Salt Lands of the Nira Valley, by Harold H. Mann, Principal, Agricultural College, Poona, and V. A. Tamhane, Laboratory Assistant, Agricultural College. Poona ...	0	5	0
40	1911	The Cultivation of Guavas near Poona, Dharwar and Limbgaon ...	0	12	0
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45	1911	Second Year's Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency ...	0	14	0
46	1911	Seed Selection Series I, Broach Cotton ...	0	8	0
47	1911	San Hemp ...	0	4	0
48	1911	Poona Furnace ...	0	7	0
,,	,,	,, (Marathi) ...	0	6	0
49	1911	An Examination of the Seed-Supply of the Ahmednagar District, Part I.	0	5	0
50	1912	An Examination of the Seed-Supply of the Ahmednagar District, Part II.	0	3	0
51	1912	Third Year's Experiments in the Treatment of Grape-Vine Mildew ...	0	3	0
52	1912	Muscovado Sugar Machinery and its scope for Gul Manufacture in India.	0	8	0
53	1912	A Method of improving the Quality of Cotton Seed ...	0	7	0
55	1913	An Examination of the Seed-Supply of the Poona District ...	0	3	0
57	1913	Improvement of the Indigenous Plough of Western India	0	12	0
59	1914	Common Salt and its use as Manure in the Konkan Division ...	0	3	0
62	1914	The Value of Castration of Deccan Bullocks ...	0	3	0
63	1914	Substitutes for Rab ...	0	3	0
64	1914	Alkali or Kalar Experiments and Completion Report of Daulatpur Reclamation Station in Sind ...	0	14	0
65	1914	A list of diseases of Economic Plants occurring in the Bombay Presidency.	0	4	0
67	1914	An Examination of the Seed-Supply of the Sholapur District ...	0	3	0
69	1915	The Rice Stem Borer in the Konkan ...	0	3	6
70	1915	Improvement of Cotton in the Bombay Presidency (except Sind) ...	0	3	6
74	1915	Well Water from the Trap Area of Western India ...	0	6	0
78	1916	Some wild fodder plants of the Bombay Presidency ...	0	13	0
79	1916	The Cultivation of Guavas in Gujarat ...	0	5	6
80	1916	List of Seeds available on the Agricultural College Farm, Poona ...	0	5	3
81	1916	Note on Fencing Construction ...	0	6	9
82	1916	Cultivation of drilled paddy in South Bombay Presidency ...	0	9	0
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86	1917	Establishment and Management of the Dairy Farm ...	0	7	0
87	1918	The Utilisation of Inferior Grass Herbage, Experiments at the Tegur Cattle Farm ...	0	2	0
88	1918	First Report on Fruit Culture as practised round about Tharushah (Sind) in Nawabshah District ...	0	2	0
89	1918	Artificial Manures : Experiments on their value for crops in Western India ...	0	3	3
90	1918	Work on the Manjri Farm for the years 1915-18 ...	0	7	3

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91	1919	The Cultivation of Berseem in Sind—Experiments at Sukkur ...	0	1	0
92	1919	Classification and Description of the Jowars of the Bombay Karnatak ...	0	10	3
93	1919	Palm *Gul* Manufacture in the Bombay Presidency (Principally Date Palm) ...	1	8	9
94	1919	The Sugarcane Borer and its Control ...	0	4	3
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96	1920	Investigations into the manure of the Salt Lands of Sind ...	0	12	0
97	1920	Prickly-Pear as a Cattle Food ...	1	4	0
98	1920	Fruit Culture as practised near Shikarpur, Sind ...	0	1	6
99	1920	The Rice Cultivation in the Larkana District, Sind ...	0	8	0
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103	1920	The Book of the Mango ...	3	5	0
104	1920	The Ganeshkhind Botanical Garden, Kirkee (Its Genesis and Development) ...	0	15	9
105	1920	The Groundnut Bug and its Control ...	0	2	0
106	1920	Dharwar American Cotton: Its History, Cultivation and Improvement...	0	7	0
107	1921	Gonag—a weed in drilled paddy ...	0	5	0
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110	1922	Year Book of the Agricultural Department in the Southern Division ...	0	5	0
111	1923	A Note on Well Boring ...	0	8	0
112	1923	Improvement of Grazing Areas in the Bombay Presidency ...	0	11	6
113	1923	Year Book of the Agricultural Department in Sind Division ...			
114	1923	Studies on the Rice Plant and on Rice Cultivation ...	0	13	0
115	1924	Shevri as a Fooder Crop ...	0	3	0
116*	1924	Sugar Industry in Western India and methods of Sugar Manufacture ...			
117	1924	Investigations in Fig Culture and Treatment ...	0	5	6
118*	1924	Land Crabs as Agricultural Pests in Western India ...			
119*	1924	Year Book of the Agricultural Department in the Southern India ...			
120*	1924	Silage for Fodder in Western India ...			

*In the Press.

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